SUPPLEMENT
TO THE
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WATER SUPPLY, & SANITARY IMPROVEMENT.

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Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 14, 1877.

The Examiners reported that no further Standing Orders are applicable to the Alliance and Dublin Consumers Gas (Bray Supply) Bill; and that the Standing Order applicable to the Gas and Water Orders Confirmation (Abingdon, &c.) Bill has been complied with. The latter Bill was then read a second time.

TUESDAY, MAY 15.

The Examiners reported that no further Standing Orders are applicable to the North Cheshire Water and Stretford Gas Bills.

The Stamford Water Bill was reported, without amendment.

The Carnforth District Water, Kent Water, and Leeds Improvement Bills were read a second time and committed.

The East Worcestershire Water and Rotherham Corporation Bills were read the third time and passed.

The Longton Corporation, Middlesbrough Corporation, and Sittingbourne Gas Bills were read the third time, with the amendments, and passed.

The Ashton-under-Lyne Gas, Coatbridge Gas, and Perth Water Bills, brought from the Commons, were read the first time, and referred to the Examiners.

THURSDAY, MAY 17.

The Rotherham Corporation Bill received the Royal Assent, by commission.

The Examiners reported that no further Standing Orders are applicable to the Newport (Monmouthshire) Gas Bill.

The following Bills, brought from the Commons, were read the first time and referred to the Examiners:—Ashton-under-Lyne Improvement; Bolton Improvement; Colne Gas; Croydon Commercial Gas; Dukinfield and Denton Local Boards of Health; Epsom and Ewell Gas; Heywood Water; Leicester Gas; Newcastle and Gateshead Water; Ramsgate Local Board; Sunningdale District Water; Thanet Gas; Wakefield Gas; Wakefield Improvement.

The Alliance and Dublin Consumers Gas (Bray Supply) Bill was read a second time and committed.

The Londonderry Gas Bill was read the third time and passed.

The Warrington Corporation Gas and the Maryport District and Harbour Gas Bills were read the third time, with the amendments, and passed.

HOUSE OF COMMONS.

MONDAY, MAY 14, 1877.

The Ashton-under-Lyne Gas, Coatbridge Gas, and Perth Water Bills were read the third time and passed.

The following Bills, as amended, were considered:—Bolton Improvement; Colne Gas; Croydon Commercial Gas; Epsom and Ewell Gas; Heywood Water; Newcastle and Gateshead Water; Ramsgate Local Board; Sunningdale District Water; Wakefield Improvement.

The Leicester Gas Bill, as amended, was considered, a clause added, and amendments made.

LOWESTOFT WATER, GAS, AND MARKET BILL (LORDS).

Mr. RAIKES, on Friday, May 11, presented the following special report from the committee on this Bill:—

"The Bill empowers the company to make new service reservoirs and other water-works, and to raise an additional capital of £60,000 for those purposes and the general purposes of their undertaking. The undertaking combines water-works, gas-works, and markets, of which the principal and more costly part are the water-works. The capital is not separately apportioned amongst the different parts of the undertaking, but forms one entire fund applicable indifferently to all the purposes of the company. The company have never paid a higher dividend than at the rate of 2½ per cent. per annum on their ordinary stock, which is saleable only at a heavy discount. Under these circumstances, the committee did not consider it necessary to insert the auction clauses required by the Standing Orders to be inserted in the case of gas companies applying for an increase of capital."

TUESDAY, MAY 15.

The Bridgwater Corporation Water and the Burslem Local Board Bills were reported.

The following Bills were read the third time and passed:—Ashton-under-Lyne Improvement; Dukinfield and Denton Local Boards of Health; Thanet Gas; Wakefield Gas.

The Bristol United Gas Bill, as amended, was considered.

WEDNESDAY, MAY 16.

The Bishop Auckland District Gas Bill, as amended, was considered.

The Glasgow Corporation Water Bill, as amended, was considered, and amendments made.

THURSDAY, MAY 17.

The Lords amendments to the Edinburgh and District Water Bill were agreed to.

The following Bills were read the third time and passed:—Bolton Improvement; Colne Gas; Croydon Commercial Gas; Epsom and Ewell Gas; Heywood Water; Leicester Gas; Newcastle and Gateshead Water; Ramsgate Local Board; Sunningdale District Water; Wakefield Improvement.

The East Worcestershire Water Bill (Lords) was read the first time, and referred to the Examiners.

The Reservoirs Bill, as amended, was considered, a clause added, and amendments made.

HOUSE OF LORDS COMMITTEE.

TUESDAY, MAY 1.

(*Before Lord* MONTEAGLE, *Chairman; Earl* MANVERS, *Lord* DELAMERE, *Lord* KENRY, *and Lord* SHERBORNE.)

LONDONDERRY GAS BILL.

(*Continued from p.* 745.)

Mr. *S. Gilliland*, examined by Mr. HAMILTON.

I have been for a long time a member of the Corporation of Londonderry, an alderman of the city, and also a member of the Harbour and other boards. I have had conversations with a great many ratepayers on the subject, and I never yet heard a person objecting to this Bill being opposed, with the exception of three or four members of the corporation. From representations made to us, I believe that mains are laid in the whole of the extended portion of the borough. There is a large amount of building ground between the point to which the mains are laid and the gas-works, but that land is being very rapidly built upon. In my opinion there is no necessity for any considerable extension of the mains. The town is very old, and some of the streets are very steep. The corporation wish to preserve the control over those streets, as they have always had. The gas company have never been prohibited, to my knowledge, from opening the streets for laying mains, or any other purpose. The corporation complain of the price charged for the street-lamps.

Mr. LITTLER objected to the question, on the ground that there was no reference to street-lamps in the petition

The CHAIRMAN said there was a general allegation.

Mr. LITTLER said he should have to call evidence to contradict.

Examination resumed: The charge used to be £3 per lamp, but it has been raised at different times, and is now £4, which we think excessive compared with other towns. I am aware of the negotiations which were carried on as to the purchase of the concern from the company by the corporation. On that occasion, there was no allegation on the part of the company, or of their solicitor, that the corporation were not in a position to pay. They agreed in committee to sell to us, and we agreed to purchase from them.

Mr. HAMILTON: Then the point on which you split was this: You were willing to give them the value of the works as they stood; but they wished to have the value enhanced by passing this Bill?

Witness: We were not aware of the advantages they would gain by the Bill at the time we agreed to purchase the works from them. We subsequently advised the corporation not to carry out the agreement, inasmuch as we received information that it would be prejudicial to the ratepayers to allow them to borrow this money, and get the advantages arising from it; that we should have to pay for all that. The agreement would have been carried out but for that. We are quite willing to purchase them now as they stand.

The CHAIRMAN: I thought you said you were informed it was advisable not to buy?

Witness: To buy the works as they stand; not to give them the advantages of the Bill. If they will withdraw the Bill, and the notice served on them yesterday morning——

Mr. LITTLER: We cannot agree to do that now, as we shall have to call a meeting of shareholders, and all that sort of thing.

Mr. HAMILTON: The council came to a resolution to purchase the works before the Bill was committed?

Witness: We have been thinking of purchasing the works for a considerable time. What retarded that purchase was, there were certain gas proprietors in the corporation, and they used every effort to induce the other members to go with them and support their Bill, and not to go with us and oppose it.

The CHAIRMAN: Those gentlemen did not vote?

Witness: After having applied to them, as a matter of propriety, not to vote, they still continued to do so. After they desisted voting, we called a special meeting of the corporation, and we had ten who voted for the motion. None of the other gentlemen appeared, although I was present when it was proved that they were regularly summoned to attend. Two gentlemen attended, one of whom signed a requisition to purchase the property; and the other gentleman stated he would vote for the purchase, although he had opposed it before. That made twelve. One other gentleman never interfered in the question from the commencement, and he is a non-gas proprietor. You will see that only left four of the corporation, who, at all events, did not signify their intention, by coming here, to vote for it. As I have stated, at a consultation, we were authorized, and we are here as a deputation from the corporation, to negotiate by arbitration at this moment for the works.

Mr. HAMILTON: With your acquaintance with the city of Londonderry, and the facilities the corporation have had for borrowing, and knowing their present financial position, what sum of money could you get, and at what rate of interest?

Witness: From the evidence given by the solicitor for the Bill, I think it necessary to explain very shortly how we happen to be £3000 in debt. The water-works in Derry were held, under the Ecclesiastical Commissioners, at a rent for 21 years. The lease expired last summer, and we had notice to quit if we did not purchase the works. I was on the deputation to Dublin to purchase the works for £2500 or £2750. We had no authority at that time, and we have an application now to Government, and they have agreed to grant us a separate rate of £15,000 to improve the

water-works and sewerage for the town, and so forth, and we anticipated getting the loan by drawing on the funds of the corporation, and paying for these water-works. They threatened to cut off the supply, and leave the town without water, and for this the corporation owe that £3000. I believe more than half of it will be collected in the rates now due.

Mr. HAMILTON: Have you any doubt you could borrow the money at 4 per cent.?

Witness: There have been far more applications to us all through; we do not want the money. People think the best security of all the public boards is our corporation. In attempting to purchase the works, we never thought of purchasing them on the security of the gas-works; we intended to give the security of the rates over and above what we now owe—about £30,000. We think if the gas company can pay 10 per cent., and capitalize as much as they have done, we ought to have as much as can pay off that if we borrow the money. We hope to get it from the Government, as Belfast did, for 35 years. They have a sinking-fund to pay it off in 35 years, and we propose to do the same, and we are ready to do it.

Mr. HAMILTON: In point of fact, there would not be the slightest difficulty in paying for the works?

Witness: We believe there would not be the slightest difficulty. We have paid off punctually every year. Our sinking-fund is £1750, and there is also the money we get from the Irish Society. That goes to the Mayor, who gets £300 a year, and we get £500 a year towards the rates of the city.

Mr. HAMILTON: What you object to is that this company, with the gas-works in their present perfect state, should be proposing to raise £24,000 for which there is no immediate or prospective use?

Witness: There is another view. Though these shares are to be sold by auction, they do not relieve our ratepayers if they are bought at high prices.

A MEMBER of the COMMITTEE: The extra price paid on the shares will reduce the rate. Suppose a share of £20 is sold for £40, the additional £20 will go to reduce the expenditure.

Witness: Who is to pay the interest on that?

The MEMBER: The ratepayer who is saved the £20.

Witness: I do not understand it in that way. I understood that they sold at double the price—a £100 share would sell for £225, and the man who bought at that £225 would expect to get his interest on the whole money.

The MEMBER: He would get the same as the other on the £100.

Witness: That would be 5 per cent., and they would still be paying 10 per cent. on the original £100 shares.

Mr. HAMILTON: They propose to divide 7 per cent. on the £24,000 which, if they did not want, would simply keep up and add to the price of gas?

Witness: They could borrow it at 4 per cent., no doubt of that.

Mr. HAMILTON: Your only object is to reduce the price of gas to the citizens—do you think you could do that?

Witness: That is not our only object. As a corporation we are empowered to light the city, and it is our bounden duty to oppose this Bill.

Cross-examined by Mr. LITTLER: I do not think the company require any more money. If I had any doubt on the subject, the evidence given by the engineer, and what I know from my own knowledge, would convince me.

Mr. LITTLER: Do you believe Mr. Stevenson when he says we want £5000 for a gasholder?

Witness: I would not venture to say; but from the description I have heard of the works you do not require a gasholder. I am aware that at the present moment the company have the power to charge what they please; but we might be in a position to get up a competing company, although it would be an extreme point to do so.

Mr. LITTLER: Do you know all the power we ask is to break up the streets under your control? Do you know that, under the Gas-Works Clauses Act, before we can touch a street we should have to obtain the consent of your surveyor?

Witness: You have to serve a notice three days before, but not to get consent.

Mr. LITTLER: Listen to what we are obliged to do. "No such street or bridge," and so on, "shall be opened except under the superintendence of the officer, and according to such plan as shall be approved by such officer." What more do you want?

Witness: I do not know what more we want. We do not want the control of the streets taken out of the hands of the corporation.

Mr. LITTLER: But that gives you the control.

Witness: I did not think it did.

Mr. LITTLER: Then you came here under a misapprehension?

Witness: I came here under the misapprehension that they wanted to open the streets on serving the notice, and that we have no power to prevent them. I have tried an experiment in gas-making myself, and found it successful at the time, although I had only from 20 to 30 lights; but when the town was extended, and the mains were laid, instead of keeping up the retorts, which certainly did not pay for 20 or 30 lights, I took gas from the company. We have one or two gentlemen in the corporation who could manage the gas-works.

Mr. LITTLER: Do you think you could manage the gas-works better than the company.

Witness: They have been managed very well. I know that at Kingstown the charge for the lamps was £3, but the commissioners there thought it was too high, and they now burn by meter. I do not know that the lamps there are put out at twelve o'clock at night. At Coleraine they are put out on moonlight nights, which would make an alteration in price of about one-eighth. I do not know how many thousand feet one of the lamps consumes, because the gas company would not give us the information. I have made several speeches in the corporation on the subject of the gas question, in one of which I stated that the company had been making 400 per cent.; but I made a mistake at that time, although I never wrote to the newspapers to correct it. The company had added £32 per share to their original shares, and that was what was running in my head at the time.

Mr. LITTLER: If they had not added that they could have put it into their own pockets?

Witness: They could have done what they pleased.

Mr. LITTLER: It is not that the £10 shares are worth £40, but calls have been made which brought them up to £40?

Witness: I have heard to-day, for the first time, that there was a call of £3.

Mr. LITTLER: Do you know there were 400 shares of £27 10s. created in 1865?

Witness: And they are selling at £40.

Mr. LITTLER: What did the ratepayers subscribe out of the £27 10s?

Witness: The ratepayers did not subscribe anything, but, in order to pay the interest on the capital, the ratepayers are charged it. I was talking about the original stock of the company, and that led me to make the observation about the 400 per cent. I meant four times the amount, and I will admit I made an error in that statement, but it was not done intentionally. The statement was so absurd that people would not believe it; they would imagine it was a mistake by me or the press. I cannot tell why the debt of £1000 to the gas company is allowed to remain so long, but it is not for want of means; it was an amount which was owing by our predecessors. The gas company have not asked us for it, or it would have been repaid. I do not imagine the gas company can borrow at 4 per cent., although the corporation can. The citizens of Derry are willing to buy the works at their full value. If the arbitrators said the value was £80,000 we should be bound to pay it if we could do so. We should have all the rates to offer as security, except £1800. We should not need to stop paving, lighting, sewering, &c., because we believe the gas-works would be more than self-supporting. I do not believe there has been one shilling of the rates expended wastefully.

Mr. LITTLER: The half year's rate only amounts to £3600?

Witness: The rates, I understand, from the returns we have, amount to £12,000 a year.

Re-examined by Mr. HAMILTON: If an agreement is arrived at between the corporation and the company, we shall be prepared to apply for an Act next year for carrying it out.

Mr. *W. Thompson*, examined by Mr. HAMILTON.

I am an alderman of the city of Londonderry, and have been a councillor of the city for 29 years. I have made myself acquainted with the opinion of the ratepayers, as to the expediency of opposing the Bill of the company, and that opinion is that the corporation should purchase the works of the company, as they consider the gas could be supplied cheaper. There would not be the slightest difficulty in obtaining the necessary funds for the purchase. We are now getting money cheaper than we have done before. The difference in freight between Belfast and Derry is about 1s. a ton against Derry, while the difference in the price of gas is 2s. per 1000 feet. The mains are laid to the extent the houses are built; but between those houses and the gas company there is a great deal of building ground, which will be built upon in some years, although that will cost the company no additional outlay to connect with the mains. There is only a very small portion where the mains do not reach. I object to the company increasing their capital by £24,000, as it is quite unnecessary, and would tend to keep up the price of gas.

Cross-examined by Mr. LITTLER: I do not think that the whole of that £24,000 will be required during the next 15 years. I heard one engineer say the works were so complete that they will last for two generations.

Mr. LITTLER: And the same engineer said that an expenditure of £5000 was immediately required; do you believe one statement and not the other?

Witness: I do not know; but one statement does not agree with the other, I must confess.

Mr. LITTLER: You talked about the price of coal in Derry and Belfast. Do you know the manufacture of 1000 feet of gas in Derry costs what they charge for 1000 feet in Belfast?

Witness: The Derry Company must manage their business very badly if at Belfast they can supply gas for what it costs in Derry. The difference in freight is only 1s., and I am sure those who have the management of gas in Derry can buy coal as cheaply as the Belfast people. The larger the consumption of gas the cheaper it can be made; and the evidence we have heard before the committee is that Derry is progressing very fast, and the consumption of gas is rapidly increasing.

Mr. LITTLER: When we get a larger consumption we are bound under the Act to lower the price?

Witness: That would be a blessing; but I was astonished to hear that residuals in Derry only brought one-third of the value of the coal, whereas in other places they bring more than half. I do not know whether the gas company sell at the best price they can get. I have complimented the present managers of the gas company, I must confess. There are no men of higher position and honour; but they have taken power to raise the price of gas, and their successors may not be so generous. Some time ago I proposed a plan of arbitration if the public were aggrieved about the quality of the gas. I would much rather the gas company had met the corporation in a more liberal spirit, than have put us to the trouble and expense of opposing them.

Mr. LITTLER: Did it not occur to you that the company might be aggrieved by your putting them to the expense of coming here?

Witness: It is their own fault. Our proposition was to modify the Bill, which they have done. The company's offer originally was 14 candles, but before they left Derry they agreed to give 16. I am glad to hear the sliding scale is to be introduced, and if the committee give us the power to purchase I shall be satisfied.

Mr. *W. Ellis*, examined by Mr. HAMILTON.

I am a Town Commissioner of Coleraine, the gas-works in which town are managed by commissioners. The price of coal in Coleraine is 2s. per ton dearer than at Derry, as we are about six miles inland. The cost of coal in Belfast is about 1s. per ton more in winter than in summer, because the passage is heavier through the Channel. The population of Coleraine is between 7000 and 8000, which is much smaller than in Londonderry. The price of gas in Coleraine is 5s. 10d., but we have a motion on the books to have it reduced to-day to 5s. We should have reduced the price last year, were it not that an excessive amount was taken from the gas-works to apply to other purposes of the town, and that reduced the working capital and the plant; we were, therefore, obliged to apply the profits of the last two or three years to keeping up the works in good and efficient order. If the Londonderry Company managed their works properly, they could buy their coal as cheap as Coleraine can; the only difference would be in the freight. The coal from the Wigan and Lancashire districts will contain as much gas for Belfast and Derry as for Coleraine. If the carbonization is good, it will produce equal results; for the condition in which the works are described to be in, they should produce gas as cheap as Belfast, and cheaper than Coleraine. We light the public lamps cheaper in Coleraine than they do in Londonderry. We charge £2 10s. per lamp. They are extinguished for something like three months in the summer for the very short nights, and sometimes they are extinguished full moon nights a little earlier.

By the CHAIRMAN: The £2 10s. includes finding the lamp-posts, and keeping the lamps in order, glazing, painting, extinguishing, and lighting. The gas is made of Wigan coal, which is capable of producing about 14-candle gas, and we have only used a small proportion of cannel for the last two years. I have no means of testing the gas.

Examination resumed: We have no complaints from the public just now. Our tar we sell at Belfast by contract at 1¼d. per gallon delivered. What is sold locally fetches 4d. per gallon. We produce 16 to 17 gallons per ton of coal on an average. From my knowledge of the price of materials and other local circumstances, I think 5s. 9d. is an exceedingly high price for Londondery. I hope before another year is over we shall reduce the price at Coleraine to 4s. 6d.

In commencing his cross-examination, Mr. LITTLER read a lengthy report made by Mr. Newbigging as to the condition of the gas-works at Coleraine, pointing out several defects, and suggesting several alterations. Among other things he complained of the leakage being so high as 24 per cent., whereas it ought not to be more than from 10 to 12 per cent. He also stated that the sale of gas per ton of coal carbonized amounted to only 6500 cubic feet, which he attributed to defective carbonization on the one hand, and excessive leakage on the other, although there was no reason why, with improved working, the company should not sell 8000 cubic feet per ton, which was a very moderate computation.

Witness said there were many gas-works in a much worse condition than Coleraine. He also stated that he had sent circulars to a number of towns, asking for information on gas matters.

Mr. LITTLER: Have you got the price in Timbuctoo?

Witness: I have several here, and you shall have them.

Mr. — *Darcus*, examined by Mr. HAMILTON.

I have been Mayor of Derry on six occasions, and three times sheriff for the city and county. For myself and others I represent one-twentieth of the rateable property of Derry. I oppose the Bill on account of the price charged for the gas, which is much more than it should be. The public lights are our great bone of contention. We have had them raised from £3 to £4, and we do not know when they may be raised again. Each rise of £1 means an expense of £500 to the city. If the corporation became the purchasers of the gas-works they could supply the town cheaper, because we should save all the profits they make. As a corporation we are not personally concerned, because we should get nothing for our trouble. I have not the least doubt we could borrow the money for the purchase at 4 per cent., thus giving the town the advantage of 6 per cent.

Cross-examined by Mr. LITTLER: There is another Mr. Darcus in the corporation—a son of mine—who was formerly in favour of the gas company's Bill passing, but who has now changed his opinion.

Mr. LITTLER: Seeing you get your rating increased, is it proper for you to complain of the public lights?

Witness: We do complain of them, because we have no control; you can charge what you like. It might be an advantage for us, under the Gas-Works Clauses Act, to be able to go to arbitration as to price, but I was not aware that was in the Bill.

Mr. LITTLER: Do you know what Parliament has put into Bills when corporations and companies have agreed to a purchase?

Witness: Yes; it is arbitration.

Mr. LITTLER: No, it is 25 years purchase of the maximum dividend—whether it is 10 per cent. or 7 per cent.; and 25 years purchase of 10 per cent. on £36,000 is upwards of £80,000. You would not like it on those terms?

Witness: I would not like to give more than the value.

Mr. LITTLER: Supposing the value is put at £90,000, would you like to go back to Londonderry and tell the public you bought the works for that amount?

Witness: I should not, but whatever Parliament has stated to be fair, we must say is fair. We ask the protection of the committee that we shall not be subjected to the caprice of those who come after the present directors.

Mr. LITTLER: But that is what we have come here to do for you—to place ourselves under parliamentary control—so that you can regulate the quality of the gas, and compel us to give the proper pressure, and supply your lamps on arbitration terms. What do you want more?

Witness: We want to get the gas without the profit being added to it. I am not aware whether we have any gas engineer present to give evidence. We came here to give evidence which we considered sufficient, without going to any expense.

Re-examined by Mr. HAMILTON: It does not require a gas engineer to tell the difference between 5s. 9d. and 3s. 9d.

Mr. *J. Greg*, examined by Mr. HAMILTON.

I am solicitor to the Corporation of Londonderry. Under the authority of the Londonderry Improvement Act of 1848 the corporation borrowed £40,000, one-fortieth to be repaid each year. The net assessable property in the borough was then £36,400. In 1855 the Improvement Act of that year authorized a further sum of £10,000 to be borrowed, the net assessable value being £38,371. In 1864 a third Act was obtained, which authorized the corporation to borrow a further sum of £20,000, at which time the net assessable value of the property had increased to £49,903, and in the ten following years it had increased to £62,000 in round numbers. During all this they have been paying off a sinking-fund of one-fortieth part. The total amount now owing is about £22,000. I have obtained my information from the town-clerk's office. The corporation have never experienced any difficulty in obtaining what money they required at 4 per cent. I have had thousands of pounds offered for them over and over again, which they could not take. It is considered one of the first securities, and the interest being regularly paid is a great inducement for people to invest in it. If the corporation obtained the gas-works, that would be an additional security.

Cross-examined by Mr. MICHAEL: During those periods of increase we have taken in a large area of excess over the former area of the borough, and with that additional area we have additional burthens to bear. [Witness was cross-examined at some length as to the financial position of the corporation.] If my advice had been taken, a gas engineer would long ago have been appointed to value the works.

Mr. HAMILTON said that was the case for the corporation.

WEDNESDAY, MAY 2.

Mr. *J. Macnie* recalled, and examined by Mr. LITTLER.

Our charge for the public lighting is £4 per lamp. First of all we have the wages for lighting, the cost of maintaining and cleaning, and so forth, and the interest on the cost of the plant, which is all the property of the company, before we can arrive at the cost for the gas. We put down those items at 16s. 6d. per lamp, which is not an unreasonable amount. We have applied a few test meters, and find the quantity consumed to be 14,000 cubic feet, which is charged for at the minimum rate to any consumer.

Cross-examined by Mr. CRIPPS: The whole of the plant belongs to the company, who do all the lighting, the corporation having nothing to do beyond paying the money.

Mr. CRIPPS, in addressing the committee on behalf of the Corporation of Londonderry, pointed out that the corporation, in endeavouring to purchase the works, were following the precedent of recent legislation. In England, corporations had, in a great many instances, become proprietors of gas-works, but he did not know whether it had been largely or generally followed in the sister country. The company, however, declined to sell till they came to Parliament, and upon the evidence of their own witnesses, if they obtained their Bill, the value of the works would be increased by at least five years purchase. There was no necessity for the additional capital, and if it were allowed to be raised, the price of gas would, consequently, be increased to the consumers. The witnesses for the company could not show that they wanted more than £2500 for extensions and improvements, for he put out of the question Mr. Stevenson's statement that £5000 was necessary for a new gasholder, the manager of the company having made no reference to that. At present the company were going on very well, and there was no complaint of a deficiency of gas. What, then, could the necessity be for an extension of the company's capital, except to obtain borrowing powers that would greatly augment the selling price of their property? Then, again, it was stated that power was wanted to break up the streets; but the corporation had never interfered with them in doing so; nor had it been shown that the new capital asked for would in any reasonable time in the future become necessary. Negotiations for the purchase of the works were broken off through the company determining to apply to Parliament, and if the Bill were now rejected, these negotiations would be resumed. There could be no question as to the ability of the corporation to pay. Why, if the corporation were unable to pay, did the company enter into negotiations with them with a view to purchase? The only explanation of the suggestion was to be found in the hope that a great accretion in value would result from the passing of this Bill. A large portion of the capital of the company, described as original, was made up of profits coming out of the concern, and upon such profits, amounting to £12,000, only 5 per cent. could be authorized, while, no doubt, they were entitled to 10 per cent. on the remainder. It was to be recollected that, if statutory powers were given to the company, competition would be made very difficult. Hitherto the company were wisely contented to make no great show of profits, and thus kept competitors out of the market. In the Bill promoted by the Metropolitan Board of Works for obtaining all the bridges in London, for the purpose of doing away with tolls, it was held that the value of the bridges was the value of the tolls levied in respect of them, and that the structural value was not an element of the value. In the same way the structural value of the gas-works could not be considered apart from the income derivable from the works. By the Standing Order just agreed to, the auction clauses and sliding scale were to be introduced into all gas Bills, requiring that the shares should be put up to public sale, and that the dividend should increase as the price of gas to the consumer was decreased.

The CHAIRMAN: Do you want the sliding scale put into the Bill?

Mr. LITTLER: We have consented to insert the sliding scale.

Mr. CRIPPS contended that the capital powers and the initial price of 5s. 9d., which the company asked to be allowed to charge, would be in conflict with the purpose of economy and cheapness of production aimed at by the recent Standing Order. Considering the price of gas in Belfast, it was out of the question to allow 5s. 9d. to be charged in Derry. The actual price charged in Derry at the present time was 5s. per 1000; but if the initial price of 5s. 9d. was allowed, the company would pay £12 5s. per cent. on their shares—£2 5s. on each share more than they were allowed to divide before. It was never contemplated that companies should commence with such an advantage. In conclusion, the learned counsel asked their lordships to reject the Bill.

The room was then cleared. On the parties being re-admitted,

The CHAIRMAN said the committee considered the preamble of the Bill was proved, the only point to be particularly considered on the clauses being the initial price.

The consideration of the clauses was then proceeded with, in the course of which

Mr. HAMILTON asked to have the dividend on the £12,000 reduced to 5 per cent., that amount being profits.

The CHAIRMAN: We could not entertain that.

On clause 52A, with reference to the standard price,

Mr. LITTLER complained that the corporation had embarrassed the inquiry by not producing a gas engineer on their side. Under all the circumstances he argued that the company ought to have 10 per cent. on the original capital of £36,000, and to secure that an initial price of 5s. 9d. would be required.

The CHAIRMAN inquired the price of gas in Belfast?

Mr. HAMILTON replied it was 3s. 9d.; and, not only had the Town Council of Belfast reduced the price of gas, but upon that reduced price they had carried over £7000 profit on the production of gas. For twenty years, excepting the coal famine year, the company had charged no more than 5s. per 1000.

The CHAIRMAN, after consideration, said the committee would unanimously allow the price of 5s. 9d. to stand.

Mr. HAMILTON submitted a clause enabling the corporation to purchase the works at a valuation, and obliging the company to sell.

Mr. LITTLER objected on the ground that Parliament had never, under any circumstances, entertained a Bill for compulsory purchase, and still less had they ever inserted clauses for compulsory purchase against the will of the promoters.

The CHAIRMAN: We unanimously refuse to allow this clause.

The other clauses were then agreed to, and

The CHAIRMAN announced that the Bill would be reported to the House.

HOUSE OF COMMONS COMMITTEES.

WEDNESDAY, APRIL 25.

(*Before Mr.* SANDFORD, *Chairman; Mr.* LAMBERT, *Mr.* HANBURY, *and Sir* HUGH CHOLMELEY; *Mr.* BONHAM-CARTER, *Referee.*)

ASHTON-UNDER-LYNE GAS BILL.

ASHTON-UNDER-LYNE IMPROVEMENT BILL.

[The following is a full report of the last day's proceedings in committee on the above Bills, an abstract only of which appeared in last number, page 749.]

Mr. MICHAEL, in resuming his address on behalf of the Corporation of Ashton, said he was endeavouring to show the previous day that, under the operation of the Act which had governed the company up to the present time, there was no interest remaining beyond the payment of the maximum dividend; and, further, that the maximum dividend being secured to a company, owing to the fluctuating character of the trade they had to carry on, and the contingencies that might occur, they would be better off than at present if the maximum dividend were secured to them upon such security as the borough of Ashton-under-Lyne had to offer. It had always been said, in cases where it had been proposed to transfer a gas undertaking to an urban sanitary authority, that it would be unfair to take away from the gas shareholder the advantage of the prospective profit given him by the operation of the Companies Clauses Act, 1863, by which when capital was at a premium the shares were allotted to the existing shareholders at par, and therefore all the benefit of the premiums fell into the pockets of the shareholders, but where auction clauses prevailed that did not in any way apply. There was no prospective profit whatever; indeed, on the other hand, instead of any further capital being of any advantage to the shareholders, it was a positive disadvantage. By a decision in the courts of law in the Leamington Priors case it was held that before 10 per cent., or any per centage, could be distributed the dividend must be equalized over the whole of the capital, though the new capital that came into the concern might be productive of a loss, or carry a much less amount of profit. If 7 per cent. were given to that new capital by the Act, that 7 per cent. must go over both new and old capital before anything in excess, to go up to the 10 per cent., could be earned by the old capital; and the same if the dividends were equalized. Though the new capital to be raised by the Ashton Company might be expended, it was expended for a considerable period before it would fructify. It was, as it were, a *quasi* preference stock which was put upon the old shareholder, and therefore it was to his advantage that no fresh capital should be raised, but that the capital should be kept down to the smallest amount. The transactions of the company showed how they had appreciated that fact, as they had endeavoured throughout to keep the capital down to the minimum amount. That was the reason why Mr. Stevenson was able to refer to the fact that they had a very small per centage of capital, as compared with other companies, upon one million feet of gas made or sold. They were met for the first time by an entirely new matter, as far as provincial gas companies were concerned, and that was the introduction, with the auction clauses,

of the sliding scale, which was said to be the antidote to the bane, and to put an end at once to any prospective profit of the gas consumer; but the profit, though put an end to, never died, because by the operation of the sliding scale it all depended on what the initial price might be, and that initial price might be of such a character as to allow continuously the largest profits to accrue to the gas company. His learned friend might urge, "See what has been done with the vast population in the Metropolis, and with that large population, and with the immense amount of capital expended. Parliament has not been afraid to introduce those clauses." To that his answer was that they knew everything about the metropolitan gas companies—they had official commissions, official referees, and official testers. At every step they were met with a mass of information and reports, which made them perfectly acquainted with the manufacture of gas in the Metropolis. They knew what the price was at which gas could be produced, and therefore the committee did not hesitate to insert an initial price of 3s. 9d., except in one case, when it was fixed at 3s. 6d. The responsibility that committee took upon themselves was nothing like that imposed upon the present committee, with the imperfect information which had been afforded. In the 20 years which had elapsed since 1856 there had been passed by Parliament 360 Acts for gas companies. Of that number 45 had had the auction clauses incorporated, but in none, except the Acts affecting the Metropolis, had the sliding scale been introduced. Up to the present time the practice was for the committee to be asked to fix in the Bill what should be the maximum price, the dividend also being fixed; but it had always been said, and very truly, that though the maximum price was inserted in the Bill, it did not follow that that price was to be charged. It was merely a kind of safety-valve introduced in order to meet contingencies which might arise. The maximum dividend being fixed, the company were bound so to conduct their proceedings, that after having provided 10 per cent. for a reserve-fund, they should only earn such an amount of profit as was competent to pay the maximum amount of dividend fixed in the special Act, or failing that being fixed, 10 per cent. under the Gas-Works Clauses Act. The consumers also had always the protection of being able to apply to the quarter sessions for an accountant to be appointed to see whether the company had conducted their proceedings in a proper way, and whether they were charging such a price as would only enable them to pay their maximum dividends, and if they were found to be charging too high a price, then that price was to be reduced. By the introduction of the sliding scale, those provisions were entirely abrogated, and there was no protection given to the consumers. The committee were asked to fix a price, absolutely and arbitrarily, which, whatever the cost of manufacture might be, the company might charge. In view of that, he (Mr. Michael) asked the committee to turn to the account to which his learned friend referred the previous day in his cross-examination of some of the witnesses, as illustrating the working of the gas company. They had a reserve-fund, but instead of using the fund as they ought to have done—to meet extra contingencies, and to cause them to have a fund to pay back dividends—they put that amount into the works. Those works were not sufficient to carry on the undertaking, from the confession of their own engineer, for Mr. Clarke said it was an improper way to conduct a gas undertaking not to have the gasholder power equal to the maximum quantity required, and if anything had broken down on the day of the greatest consumption a portion of the town would have been left in darkness, as they had no reserve powers whatever. Their whole object had been—and it was wise from their point of view—to keep down the capital, in order that they might be certain to have the maximum dividend to pay their shareholders. In 1875 the total profit earned was not the £4700 which was required to pay their dividend, but was only £1425. According to that statement, they had to take from the reserve-fund £3300, and therefore a single year and a half would have exhausted their reserve-fund according to that calculation. But if the committee would look at another item in this account, they would see that the company absolutely expended £3377 1s. 10d.—or 8 per cent. upon their capital—for the repairs of works. How did that enure to the injury of the gas consumers? If the committee would turn to the next sheet (for the year 1876) they would see an item of £4965 for repairs in that year, and yet they would find the company had a balance of profit of £4820. Supposing those two accounts to be correct, there was absolutely a difference of profit between £4800 and £1425, and the prices were, to a great extent, the same, because the reduction in price did not enter into that account. Under those circumstances it was a difficult matter for the committee to determine what the initial price should be. In that year the price of gas was raised by 1½d., owing, as Mr. Clarke said, to repairs: "Those three years in which these large sums so occurred are wholly exceptional. We have charged the original cost of the gasholders into these three years." If that were so, they must strike out the exceptional item, and strike out the 1½d., leaving in the sum that ought to be carried on from year to year in order to meet the proper amount for repairs and renewals. That left 8d. to take off the price of gas. The committee had not sufficient evidence to determine whether or not they should take off the 8d., or the 3d. which Mr. Stevenson was alleged to acknowledge was a surplus upon the price. If what was improperly charged to revenue instead of to capital—*i.e.*, £5000—ought to have been put into capital to pay 10 per cent.—that was £500 a year, at 10 per cent., but it was only £250 a year properly, because the 10 per cent. capital was raised at 5 per cent.—it would only have been £250 to be charged on the gas undertaking, and come out of profits. There was, therefore, in that single year £4750 charged in excess of the amount that ought to have been, and that came out of the pockets of the gas consumers. The gas-consuming body was a fluctuating one, and it was no use to say they would obtain some advantage ten years hence. They had a right to ask that the affairs should be so conducted, that year by year they should have any advantage arising from the proper and economical conduct of the company's works—works which ought not to have been conducted by an accountant—works in respect of which there ought not to have been such a resolution as had been read to the committee from the minute-book, showing a sad neglect of the company's undertaking. The corporation had a right to say they could conduct the works better; they would have a proper manager and engineer, and would not have those fluctuations. It could be seen by the action of the company that they had no great interest in the concern. They parted with Dukinfield; they would presently part with the Houghton district, and when it suited them with Audenshaw. There was nothing to prevent them cutting off any portion of their district. The company had to pay 5 per cent. upon their capital, while the corporation could raise it at 4 per cent., and even if they were obliged to provide a sinking-fund that would not take it up to the amount they had to pay at present. The attention of the committee was particularly asked to the introduction of the sliding scale, which would not only operate to the advantage of the shareholders upon the capital now asked for, but over the whole capital. Capital raised under one condition was, by the action of the sliding scale, to have an advantage given to it totally foreign and alien to the powers under which it was raised. The whole of the £47,000 would realize the advantage of the sliding scale. At present it was strictly limited to 5 per cent., or to such amount as it would realize in the open market; but now it was not only the new capital which would have the advantage of the sliding scale, but the whole of the previous capital, to the injury of the corporation as representing the gas consumers and ratepayers of the district. Why should that advantage be given? It never was contemplated in the old Act. If advantage there be, why should it not be given to the gas consumers and ratepayers? Under the provisions of the Public Health Act, 1875, the corporation were charged to see that there was proper lighting in their district, and they were liable to a *mandamus*, to be obtained by the Local Government Board, if they did not carry out their engagements properly, and therefore they wished to have the conduct of the gas undertaking, so as to be able to carry it on in such a way as would impose the least possible burden upon the ratepayers. They asked the committee to allow them to equalize inequalities, to allow them to consider the fair discount to be allowed to the large consumers as against the small, to put it into their power to equalize the price which should be charged upon persons near to the gas-works, who cost less to supply than persons who lived a long distance from the works, for it must be very evident that gas could not be supplied at a distance of two miles from the works, as it could be close to them, because there was the primary cost of laying down mains, of additional leakage, and loss in illuminating power, and the sparse population who took a supply from the mains. He (Mr. Michael) asked the committee whether the corporation had not made out a case to show that while they did no injury, and must confer benefit, they should be allowed to economize the supply of gas, and if any profit was to be derived from it, that profit should be earned by the consumers rather than by a company, which at present really did not exist, because it was a company to be constituted that day. He would not dwell much upon the consideration, but the corporation being the highway authority, it evidently would be more economical, when they were breaking up the streets, to be in the position of representing the interests of the gas consumers also. The whole tendency of modern legislation had been, where no injury was to be inflicted, to put the local administration into the hands of the local authority. The committee had not heard, in the progress of the case, any single reason why the prayer of the petition should not be granted, and why they should not transfer the undertaking. On the other hand, there were the gravest reasons why the company should not be allowed to extend their works on the site they had chosen. If the works passed into the hands of the corporation, they would have ample power so to extend them, as to meet all the wants of the community without creating a nuisance and without doing injury, and all they would do would be for the benefit of the gas consumers and ratepayers. He therefore asked the committee to pass the preamble of the Bill of the corporation, and reject that of the company, in order that the lighting of the community might be placed in the hands of the former.

The CHAIRMAN said the committee were of opinion that the preamble of the Ashton Gas Bill was proved, and therefore Mr. Cripps need not address them on that subject, but only on the question of the maximum initial price and the sliding scale.

Mr. MICHAEL said he did not intend to take any part in the discussion on clauses.

Mr. YATES said he should like the standard price to be lower than 3s. 9d.

Mr. CRIPPS said the Earl of Stamford's petition was simply to the effect that, if powers were to be given to purchase, they ought not to be compulsory.

The CHAIRMAN said the objection to Mr. Yates had better be taken when he rose upon the question.

Mr. CRIPPS said that at the present time, and under their present Act, the company had the power of charging a maximum price of 5s. 6d. per 1000, reducible to 5s. when the sale exceeded 50 million cubic feet; but that point was arrived at some time ago, and, therefore, the present maximum was 5s. Consequently, if the price of coal were to rise, or if any accident occurred, or the price of labour were to rise, the company, who now charged 3s. 11d., could raise that price at any time to 5s. to make their 10 per cent. dividend safe. Beyond that, in their present Bill there was no compulsion as to what should be the illuminating power of the gas, and that would be the same as being able to charge more; because if they found the price of coal increase, and their business not so profitable, instead of giving an illuminating power equal to nearly 18 candles, they could give 10 candles, 12 candles, or any other number, without incurring any penalty whatever.

The CHAIRMAN: I may tell you now what is upon my mind. It appears to me that under the sliding scale—I am looking at it solely in the interest of the consumer—the illuminating power of the gas ought to be considerably raised, as otherwise it is the interest of the company to furnish the consumer with a cheap bad gas.

Mr. CRIPPS said what they were going to do by the present Bill was to incorporate the Gas-Works Clauses Act, 1871, obliging them to fix the illuminating power, and also to give facilities for testing by the public authority to see that that illuminating power was kept up, or to impose a heavy penalty if it was departed from, so that they were taking upon themselves very much more in favour of the public than they had been liable to before. If the committee decided that the illuminating power should be 16 candles, it would ensure the ordinary average to be 18 candles; but the company were quite willing to accept that standard. The Gas-Works Clauses Act also provided a proper pressure and proper purity according to the standard, and the company accepted that responsibility, not having been liable to it before. With reference to the sliding scale, the wording of that clause was copied from the metropolitan Acts. After fixing the standard price—which was a very different thing from the maximum price—it stated that "for every penny charged in excess or in diminution of such standard price in any year, the standard rate of dividend for such year shall be reduced or increased by 5s. in the £100 per annum." A total mistake had been made in arguing that matter with reference to the sliding scale—as if it were to be a benefit to the shareholder and not to the consumer. It was a consumer's device, and was first brought up on behalf of the consumer, although he (Mr. Cripps) believed in the end it would be for the benefit of the gas companies if they conducted their business carefully and economically. It was, however, very possible that, when the price was reduced to the consumer, it might be a long time before it was any benefit to the gas shareholder. The Gaslight and Coke Company, in the second year after their Act had passed, had reduced the price to consumers, and they would be entitled, if they found any surplus left over that to divide it; but they did not anticipate that. The first thing was to reduce the price, and it was only as a consequence of that they could get anything; but it was not a necessary consequence. Some of the witnesses had totally mistaken what the sliding scale meant.

The CHAIRMAN: I think I may say the committee perfectly understand that, and they are of opinion that the sliding scale is in favour of the consumer.

Mr. CRIPPS said he would then pass on to the standard or initial price, which was originally inserted at 4s.; but after the company had considered the matter more, with Mr. Stevenson's assistance, he (Mr. Cripps) had taken upon himself the responsibility of advising 3s. 9d. It must be remembered they were going to incorporate the Gas-Works Clauses Act, which would involve more expense to produce gas than at present. Under those circumstances was 3s. 9d. more than they ought to have? Only a short

time previously the Chairman of Ways and Means had given, in the case of the borough of Louth, a price of 4s. 7d., but precedents could not be relied on very strongly, because circumstances differed. The sliding scale was at present in its infancy, and nothing would be so prejudicial to future gas legislation as to do anything which might be considered unfair or hard upon the companies themselves. In all cases of that kind it was necessary to have the co-operation of the company, but that could only be obtained by treating them in the fairest possible manner. There was unquestionably a possible loss of 10 per cent. dividend entailed upon the company by imposing a sliding scale. They were secure of 10 per cent. at the present time, and, if the price of coal rose, they could raise the price of gas, and so get their 10 per cent., but they were giving that up and taking their chance. That was a new principle, which probably would be applied universally if it acted well, and was certainly a most useful principle for the consumers. It would be unfortunate if, so soon after the resolution of the House, anything were done which the companies would consider made that sliding scale so unfair to them that they could not accept it, or would not apply for it. Mr. Stevenson's estimate of the proper price to be charged was 3s. 8d., taking into consideration the present price of coal and other circumstances, but there was no allowance made in that estimate for coal being at the present time very cheap, nor yet for the additional expense that might be put upon the company by reason of the limitation of the illuminating power, and more especially as regarded the purity of the gas. On the following day a very important Bill was going to be brought in by certain of the metropolitan gas companies to get rid of some of the restrictions put upon them with reference to purity. They said the matter had gone too far—that they had been put to a greater expense than the thing was really worth, and they were going to try whether they could not get off some of the restrictions as to purity which were attached to them under the Act of 1871. However, it was a very heavy onus to put upon them—more than 1d. per 1000—but if that was added to Mr. Stevenson's 3s. 8d., quite independently of the probable increase in the price of coal so soon as trade revived, it would make a fair starting point of rather more than 3s. 9d., certainly not less. Another way of testing the matter was—and the attention of the committee was particularly directed to that point—that after Mr. Stevenson had given his evidence, Mr. Lyon did not in any way challenge Mr. Stevenson's figures. He said, "I took my figures from your books." Mr. Stevenson's evidence stood clear, therefore, that, without taking into consideration those questions of purity, and so on, the company ought to have a price of at least 3s. 9d. Mr. Stevenson also said there had been fair working, and whatever more was put upon the company would be so much out of their pockets. The only objection raised to the accounts was that they had charged too much for renewals and repairs in the later years; but, if the committee looked on the other side, they would find the company did not earn their dividend, or anything like it. In one year they only earned a profit of £1400, while £4700 odd was required to pay the dividend of 10 per cent.

The REFEREE: Look at the next year, when you made your 10 per cent. and also effected very heavy repairs.

Mr. CRIPPS said, taking the two years together as an average, it was less than enough to pay their dividend. Taking the average when they might, they had not earned enough for several years past to pay their dividends. That was a most material matter in considering whether they could have divided their 10 per cent. if they had not done those repairs.

The REFEREE: The contention is that you took out of income money for expenses which properly ought to have gone to capital account.

Mr. CRIPPS said that was a mere matter of account. So far as the body of the consumers were concerned, it mattered not whether it was done by setting aside a depreciation-fund, or by spreading it over a few years. It made no difference to the company whether it was done in one way or the other. It was not the consumers, but the shareholders, if anybody, who had the right to complain of the directors for having applied the reserve-fund for the purpose of renewals. If the corporation assumed to represent the consumers, they must do so as a class, and not the consumers of one year as against the consumers of another year. It was only by more economical working and more energy in business that the company could hope to make 3s. 9d. anything but a loss, and he (Mr. Cripps) was not at all surprised that his clients thought that 4s. was a price they might fairly ask in the first instance. He, however, could not have supported anything quite so high, but he did think that 3s. 9d. was abundantly fair to the consumers; it was a reduction at once from the maximum they had been entitled to charge. To go to another point, he did not say that precedent was everything in a case like the present; but he thought it was most important not to go lower than that which had been fixed as the initial price over the greater part of the Metropolis, which was 3s. 9d., with the exception of the South Metropolitan district, which had only been paying 3s. 2d., and about which there was a great fight, the result being that the initial price in that district was fixed at 3s. 6d. Suppose the parties did their best, let them compare the two sets of circumstances. Coal might be somewhat cheaper in Lancashire, but there was a greater demand in London for the residuals and for coke, and therefore there was great analogy between the two cases in that respect; but there was another matter, which was so immensely different that it totally destroyed any difference that might have arisen from what had been just referred to. The number of consumers upon so many yards of main in London was not comparable with the number in any other place. The population was so dense, and the area to be supplied so entirely built upon, that the profits to the gas company in supplying at per 1000 cubic feet was so much greater, and the quantity supplied from a given main so much larger, that it would totally alter any little difference, if there was any, with reference to the price of coke and labour. Seeing, therefore, that the manufacture of gas from coal could be made a much more profitable thing in London than it could at Ashton-under-Lyne, and assuming that the parties worked equally well in doing their best, contrasting one with the other, there could not be the slightest reason why the initial price at Ashton should be one farthing lower than it was for the north side of London. There being no other precedents to go upon than the Metropolis, he (Mr. Cripps) expressed a strong hope that the committee would not, in the infancy of the matter, do anything which the company would consider a prejudice to them; or, in fact, do anything to cause great dissatisfaction with the sliding scale generally. When they came to the circumstances of the Ashton Gas Company, working the matter out any way they would—whether by looking carefully into the figures and seeing that they had had to get 3s. 11d. hitherto for the purpose of dividing the profit, or whether they took Mr. Stevenson's argument, that 3s. 8d. was a fair price under the present state of things, it was submitted to the committee that they would not think 3s. 9d. to be a higher price than the company were entitled to ask for. The success or failure of the sliding scale depended on the fairness of the price in the first instance, because that price could never be varied unless the dividend of the company was altered. It was not a question of making a profit entirely for the benefit of the shareholders; but if a profit was made it would go first to the consumers and then in the same proportion to the company. They might go on making gas cheaper by economy and good management, but what was derived from reduction of price could not go to anybody but the consumers jointly with the shareholders. He (Mr. Cripps) therefore trusted, in fairness to the company, that not a single farthing lower than 3s. 9d. would be imposed upon them.

Mr. YATES applied to be heard in opposition to the standard price, as he contended it should be lower than that proposed.

Mr. CRIPPS objected, and read certain paragraphs in the petition of the Earl of Stamford.

The CHAIRMAN said the committee thought Mr. Yates had a right to be heard.

Mr. YATES said his learned friend had addressed the committee entirely upon the assumption that there should be, at all events, a dividend to the company of 10 per cent., and that that was to be the dividend they were always to have, just as if they were guaranteed that dividend. His argument had been entirely founded upon that view, and not upon the view of giving the cheapest gas it was possible to supply with a fair ratio of interest to them as a gas company. He had made his comparison entirely with London, treating the London companies as being the only ones who had had a sliding scale introduced into their Acts; but he submitted to the committee that London was not a fair test to compare Ashton-under-Lyne with. In the first place, London was a very great distance from coal, while at Ashton the coal existed right under the town, and there was nothing more than cartage to pay for; they got it almost out of the pit on to the gas company's premises, and if so it was delivered at the cheapest rate to the company. Mr. Stevenson had said that the net price of coal in Lancashire was 8s. 6d., but in London, in addition to that, there was 6s. 6d. for carriage, and then there was barging and trimming, he supposed, the London coal dues, and the cartage to the company's premises.

Mr. CRIPPS: They have a wharf of their own.

Mr. YATES said in that case there was 6s. 6d. to add, *plus* barging and trimming, on to the 8s. 6d. before they got the price of coal delivered in London. It was also said, in order to show that London was on an equality with Lancashire in the price of coal, that the price of coke was much more in London than in Lancashire. Upon that there was no evidence one way or the other, but there must be a large inequality indeed to make up for the difference between the two. Mr. Stevenson said there was an advantage in Lancashire in the price of labour, and if that were so there were at all events two advantages in favour of producing cheaper gas in Lancashire. If they took Burnley, which produced 150,000 cubic feet, against 133,000 at Ashton, the mean price of gas there, both inside and outside the district, was 3s. 6d. per 1000. They had coal all round Burnley as they had at Ashton. The wages would be about the same, and the price of coke also. Taking Manchester, there was an enormous difference in the amount of gas made, the quantity being 1,900,000 cubic feet, and the mean price there was 3s. 7d.

The CHAIRMAN: In Manchester the corporation have the gas-works, and they have not to divide 10 per cent.

Mr. YATES: But they have to earn interest upon their capital; they make £80,000 or £90,000 a year upon the gas-works there.

Mr. CRIPPS said his learned friend was quoting things which he should have to reply to. He had a general reply upon the whole case, and no one had the right to address the committee after he had finished.

The CHAIRMAN said he understood Mr. Cripps was addressing the committee upon the clauses which he had proposed.

Mr. CRIPPS said he thought he was on the preamble.

The CHAIRMAN said the committee had considered the preamble to be proved.

In reply to the chairman, Mr. YATES said he did not propose to call any evidence. Resuming his remarks, the learned counsel said that, taking the company's own figures, the mean price was 3s. 11d., but that price he presumed was subject to discount.

Mr. CRIPPS: It is without the discounts.

Mr. YATES said in that case, taking their own figures in 1871 and 1872, it seemed that in those years they were enabled to sell gas at 3s. 9d., and take off the discounts; that was to say, taking off 6d. to every one who paid within a certain time. With regard to the liability which they took upon themselves, they proposed to give gas of 16 candles, while according to the evidence they had been giving 18 or 19 candles up to the present time, and, therefore, they proposed, instead of giving better gas, to give a lower illuminating power.

Mr. CRIPPS complained that his learned friend was getting out of order.

Mr. YATES said he was only saying what they had been doing; they had been supplying gas at 4s. 2d. per 1000 feet, less 6d. discount, which was 3s. 8d., and they had been supplying gas of 18 and 19 candles, but by the present Bill they proposed to charge 3s. 9d., and to have an illuminating power of 16 candles, so it was clear that they were proposing two candles less and 1d. more.

The CHAIRMAN said it was explained about the candles that virtually it was giving 18 candles.

Mr. CRIPPS said his learned friend had taken the prices charged in towns supplied, not by companies, but by corporations, so that the whole thing was different. A corporation had a right to fall back on the rates—a corporation could never incur a loss, if they had rates to supplement it—a corporation might always keep the thing at a minimum, while a company had to run the whole of the risk, and, therefore, the cases were totally different. A corporation might say, "We will sell at almost anything, and if we cannot get on at that we will have a rate," and, therefore, the comparison did not apply; but if the committee took the test of towns supplied by corporations, even then the proposal his clients made was very low. At Barrow-in-Furness the charge was 5s. within and without the borough; at Blackpool, 4s. 2d. within and without; at Bolton, 3s. 6d. within, and 4s. 3d. and 4s. without; at Burnley, 3s. within, and 4s. without; at Bury, 3s. 9d. within and without; at Halifax, 3s. 4d. within, and 4s. 10d. without; at Heywood, 4s. 2d. within, and 5s. 7d. without. He would not go through any more; but even in those cases where the corporations had to run no risk, they were not so low as the Ashton Company proposed the standard to be.

Clauses 1 to 10 and A to E were then read and agreed to.

On clause F the committee-room was cleared. After some time the counsel and parties were called in, and

The CHAIRMAN said the committee were of opinion that the initial price should be 3s. 8d.

The remaining clauses were read and agreed to, and the chairman was directed to report the Bill to the House.

MONDAY, APRIL 30.

(*Before Mr.* PLUNKETT, *Chairman; Mr.* FOLJAMBE, *Mr.* STARKEY, *and Mr.* COURTNEY.)

CRYSTAL PALACE DISTRICT GAS BILL.

Mr. PHILBRICK, Q.C., Mr. MICHAEL, and Mr. PAULI appeared for the promoters; Mr. CRIPPS, Q.C., and Mr. O'HARA for the Metropolitan Board of Works, petitioners against the Bill.

Mr. O'HARA, at the sitting of the committee, applied that this Bill and the Bill of The Gaslight and Coke Company might be taken together, on the ground that the questions involved in each were similar. The object of the present Bill was to amend the 17th section of the Crystal Palace District Gas Act, 1873. That clause provided that the gas supplied by the company should not contain more than 20 grains of sulphur in any form

in 100 cubic feet of gas. The promoters sought by this Bill to be relieved from that condition. The Gaslight and Coke Company by their Bill also sought to be relieved from a similar obligation under a somewhat different form. By their Act of last session, which revised many of the provisions of the City of London Gas Act, 1868, three gentlemen, called Gas Referees, were appointed by the Board of Trade, and it was the duty of these Referees to prescribe, from time to time, the maximum amount of sulphur impurity to be allowed in the gas supplied by the company; and to that duty was attached the condition that they should ascertain with what degree of purity the company could supply gas continuously without occasioning a nuisance in the neighbourhood in which their works were situated. But both Bills, though different in form, related to the question of the maximum amount of sulphur impurity to be allowed in gas. In the one case, the maximum amount was prescribed in the company's Act; and in the other, the amount was to be prescribed under special conditions mentioned in the Act. He (Mr. O'Hara) appeared with his learned friend Mr. Cripps in this case, and with Sir E. Beckett in the next, which was the larger case, and they were exceedingly anxious on this point. Of course an investigation like this involved the examination of scientific witnesses, and other persons whose attendance it was difficult to obtain, and whose remuneration was a matter of great consideration to the Board and to the Corporation, for whom he appeared. He had, therefore, to ask the committee to allow Mr. Philbrick to open the case for the Crystal Palace District Gas Company, and, when the evidence on that Bill had been heard, the committee would suspend their decision until after they had heard the case of The Gaslight and Coke Company. He admitted that he was asking for a slight departure from the usual course, but he thought it was one which would be most convenient for the committee, and advantageous to the public.

Mr. MICHAEL said he appeared for the gas companies in both cases. It was not for him to dictate to the committee what course they should adopt, but he thought he could put before them some considerations to prove that it was not desirable to adopt the course suggested by his learned friend. Although it was quite true that the objects of the two Bills, so far as the sulphur question was concerned, were identical, the matters which the committee would have to consider, in coming to a decision on each, were as diverse as they could possibly be. In the first place, the area supplied by each company was essentially different; the one was suburban, the other was entirely metropolitan. Now the circumstances attending the production of gas and the dealing with the refuse products were in each case different. In the surrounding places the parties who appeared in opposition to the two Bills were quite different persons. In the case of the Crystal Palace District Gas Company, the Metropolitan Board of Works obtained a *locus standi* before the Referees, because the company, although not a metropolitan company, supplied gas within a small portion of the metropolitan area. In the case of The Gaslight and Coke Company, the Metropolitan Board and the Corporation appeared to oppose, and was it fair that the promoters of the first Bill, being a small company, should be put to the expense of attending before the committee, and waiting the whole course of the proceedings of a large company with immense revenues, and having a considerable number of witnesses to call in support of their case, when the question which the committee would have to decide was, as he ventured to assert, knowing the particulars of both Bills, entirely different in each? In the Crystal Palace District Gas Company's case, the question pure and simple was whether or not the restriction as to the quantity of sulphur other than sulphuretted hydrogen should be allowed to continue. In the case of The Gaslight and Coke Company there were complicated questions with reference to the duties of the Gas Referees. These questions did not affect or interest the promoters of the first Bill, as the Referees had no control over the gas supplied by them. In truth, what he considered the crucial point of the whole matter was this, that it did not follow at all that the decision in the one case would govern the decision in the other. The case which would be presented for the Crystal Palace District Company would be so placed before the committee that they would be able to come to a decision upon it without any reference to the circumstances which would be afterwards brought before them on the other Bill.

The committee having deliberated,

The CHAIRMAN said the committee felt that, though the parties had a right, according to practice, to have the two cases heard separately, they might, with a view to economize time and expense, hear the promoters of both Bills together, then take the opposition to the Crystal Palace District Company, and dismiss them from attendance, hearing the opposition to The Gaslight and Coke Company's Bill afterwards. It seemed a rather unnecessary expenditure of time and money that the cases of the promoters of the two Bills, if they were really and substantially the same, should be heard twice over.

Mr. MICHAEL said the committee would find they were entirely the reverse. Except the scientific portion, there was nothing in common.

Mr. O'HARA said he would then propose to his learned friend to take the larger case first.

Mr. MICHAEL declined to consent to such an arrangement, which he said would be grossly unfair. The witnesses for The Gaslight and Coke Company were not present, to begin with, and he was not prepared to go on with that Bill.

After some further conversation, the committee decided to proceed in the usual course with the first Bill.

Mr. PHILBRICK opened the case for the promoters. In doing so, he said: Sir, it devolves upon me to state to the committee the case of the first Bill before you, which is that of the Crystal Palace District Gas Company, and which is, as you have heard from my learned friend, Mr. O'Hara, a short Bill. It seeks to accomplish its object with singular brevity and directness —namely, to repeal a portion of section 17 of the company's Act of 1873, which restricts the maximum quantity of sulphur to be contained in the gas to 20 grains per 100 cubic feet, with the proviso that nothing in the repeal shall authorize the presence of sulphuretted hydrogen in the gas to be supplied to the consumers. Now, sir, from what has passed in a preliminary discussion, I am afraid that the committee may have formed the opinion that the matter embodied in this Bill is likely to involve considerations of a highly scientific and delicate nature. I think, if I am sufficiently able to explain that which, I trust, I in some measure appreciate myself, the matters in this Bill will not resolve themselves into any considerations of that kind, or involve such minute and delicate analyses as seem to be hinted at. If I shall be successful in conveying to the committee what has been brought to my mind, the matters that will have to be disposed of will depend not entirely on chemical or scientific results of analysis, but upon what I may rather call physical considerations; and if at all I venture, in the course of the remarks I am about to make, to describe the history of gas-making, the committee will understand it is simply for the purpose of enabling them to follow the evidence, and to bring it to a point at once, instead of troubling them with a great quantity of scientific analysis, and the results of rather elaborate tables, which have had to be gone through in order to get at what I shall be able to state briefly. I may mention at once that the position of the Crystal Palace District Gas Company differs entirely from that of the large companies, or rather large company who supply London. I say large company, because, practically, on the north side of the Thames there is but one company, The Gaslight and Coke Company, who, by a series of amalgamations and extensions, have become the great supplier of gas on that side of the Metropolis. We, the Crystal Palace Company, are situate on the south side, and we were originated and incorporated under a deed of settlement in the year 1854, shortly after the Exhibition was removed from Hyde Park to Penge. It so happened that in the year 1855 the Metropolitan Board of Works were organized and incorporated chiefly for the purpose of removing the sewage of London out of the Thames, and of constructing a large system of drainage for the Metropolis. In drawing the line for the metropolitan area to be under their jurisdiction, it was so drawn as to include a portion of the suburban district—about one-third of it—which was within the limits of supply of the Crystal Palace District Gas Company; and in that way, and in that way only, did we become, as it were, under the jurisdiction of the Metropolitan Board of Works. In 1858 we obtained parliamentary powers, and put ourselves under the Gas-Works Clauses Act of 1847. That Act is a general Act, which is incorporated in all Acts of gas companies throughout the country, and it contains a series of clauses applicable to such undertakings, framed much as the Lands Clauses, or the Police Clauses, or the Town Commissioners Clauses (which are general Acts) are framed. By those clauses, under which we were until the Act of 1873, we were bound to supply gas of not less than 12 candles illuminating power. We had a maximum price of 6s. per 1000, and under our Act we obtained power to raise our capital, subject to the ordinary restrictions—that is to say, our maximum dividend not exceeding 10 per cent. per annum. In 1865, our district having increased, we came to Parliament, and got powers to raise additional capital; and in 1873 we obtained a further Act, the 17th section of which we propose to partially repeal by the Bill now before the committee. The necessity for coming to Parliament in 1873 arose from the fact of the growth of our district, and our resources not being adequate to supply our consumers without a further expenditure of capital. We had at that time raised a considerable portion of our capital, not at 10 per cent., but at 6 per cent.; we had exercised our borrowing powers, and we had for years been doing that which we have continued, thinking it the right course for the company, and a course the best adapted to our own interest and the interest of our consumers, all in the same direction—we have been, so far from charging our maximum price, keeping our price down—we were raising our capital only when compelled, and not raising it to the maximum amount of dividend which we were entitled to charge, so that in consequence we were supplying gas in the suburban districts practically as advantageously as gas was being supplied within the Metropolis itself; and in addition we were burdened with a very small capital in proportion to the amount of the district we were supplying, and the extent of the gas we were making. When we came to Parliament in 1873, the Metropolitan Board of Works appeared to oppose us, and what they wanted to do was to include us within metropolitan gas legislation, and to bring us to the level of a metropolitan gas company, putting us under the Referees and under the restrictions that were then in existence as to the metropolitan companies. You may, sir, perhaps know—but it is not for me to anticipate the case of The Gaslight and Coke Company—but you will certainly hear at great length, and I may state it shortly, that the metropolitan gas companies in the years 1868 and 1869 were placed under a tribunal called Gas Referees, appointed by the Board of Trade. The gas was directed to be tested by a number of gentlemen called Gas Examiners, and the general provisions of the system of gas legislation then in force in the Metropolis involved a maximum price to be charged for the gas, with a power on the part of the companies to come before commissioners appointed by the Board of Trade to revise the price in case they desired to increase the maximum, and there was a similar power of revision, in the interests of the consumers, before the same commissioners, in case the consumers desired to reduce the price of the gas. The commissioners were a body who have since become extinct. They were to consist of an accountant, a gentleman practically versed in gas manufacture, and a barrister, who presided as chairman. My learned friend, Mr. F. S. Reilly, presided; Mr. Pattison was one of the commissioners, and Dr. Odling was the third commissioner. That system was alleged by the Metropolitan Board of Works and by the Corporation to work to some extent prejudicially to the interests of the consumers; and in the year 1875 a very lengthened investigation took place in Parliament before a committee, of which Mr. Forster was the chairman. The result of that inquiry was that, although no legislation took place with regard to The Gaslight and Coke Company, certain principles were arrived at which formed the basis of an Act then passed, which affected the Commercial Gas Company; and, in 1876, these principles were embodied in an Act affecting The Gaslight and Coke Company. But these provisions and the whole of that legislation were applied to the Metropolis properly so called, and never touched and never affected the Crystal Palace District Gas Company. In 1873 it was desired by the Board of Works to include us within the limits, and subject us to metropolitan legislation; but after some considerable discussion, the committee thought we were not a company falling within the purview of that legislation, that we were exceptional, and that our case depended entirely upon its merits, and they excluded us from the operation of metropolitan Acts. The chairman said: "The opinion of the committee is that each of these companies as they come before Parliament ought to be taken upon their merits. This case is not to be taken as a precedent with reference to any of the metropolitan districts. It is one which the committee have thought exceptional, and depending entirely upon its own merits." So that the attempt of the Metropolitan Board of Works to subject us to metropolitan gas legislation entirely failed. The question was then set at rest—and I think I may say set at rest for ever—that we were not a metropolitan company, but were to be dealt with like other gas companies.

Mr. CRIPPS: I assume my learned friend would not state this unless it had some bearing, and if it has, it has some importance; the fact is, the committee did not decide whether they were within or without these obligations, but that it was a case to be taken by itself. Some of the regulations, or a great many of them that applied to the metropolitan companies, were put in, and others were left out.

Mr. PHILBRICK: My learned friend, Mr. Cripps, did not follow me. I read the exact words that fell from the chairman.

Mr. CRIPPS: Then you went on to say that you were entirely excluded from the legislation of the Metropolis?

Mr. PHILBRICK: I say we were not included in the general Acts of the legislation of the Metropolis. In the Bill, however, which we brought forward at that time, and which was principally a money Bill, we said that we were willing to give the consumers the benefit of an increased illuminating power in the gas. I have told you that we were under the Gas-Works Clauses Act of 1847, with a limit of 12 candles; but we then volunteered to place ourselves under an obligation to supply 14-candle gas. That was a voluntary obligation undertaken by us. The 17th section of our Act then provides—"And such gas shall not contain more than 20 grains of sulphur in any form in 100 cubic feet of gas." Those words we are now proposing to repeal. I will just tell the committee how they came to be in that Act. In the cross-examination of Mr. George Wilson Stevenson, the very eminent gas engineer, who was a witness for the promoters of that Bill, he was asked whether there was any clause in

the Bill, as then introduced, as to purity—that is page 25, question 151. It was an immaterial question, because I think I was then representing the Metropolitan Board of Works, and it was a question that fell from me:—"By the by, there are no clauses in the Bill as to purity, are there? (A.) I think not; I do not remember that there are.—(Q.) Nor are there any in the Act of 1871, are there? (A.) Yes.—(Q.) Except as to sulphuretted hydrogen? (A.) Yes.—(Q.) Not as to sulphur or ammonia, nor any product of sulphur, except only as to sulphuretted hydrogen? (A.) Just so. I think it is quite right that there should be clauses inserted to protect the consumer from an undue amount of sulphur and ammonia." And there I left it. That was Mr. G. W. Stevenson, who was a witness on the part of the promoters of the Bill; and when he came to be re-examined by my learned friend, Mr. Horace Lloyd, he was asked this:—"At present they are under no test for purity, and you say there is a test for sulphuretted hydrogen by the Act of 1871? (A.) Yes.—(Q.) You think there should be one as to sulphur. (A.) I think there should be one as to the maximum of sulphur.—(Q.) What quantity of sulphur? (A.) I think 20 grains. The promoters have not consulted me upon that point at all. I think it is quite right." Upon that the 20 grains were put into the Bill in the shape in which it is now an Act; and it is because we have found that that which was then supposed to be an ordinary limit which might fairly be fixed, and which would be carried into practical working in the manufacture of gas, without either nuisance, or inconvenience, or undue expense, is intolerable and almost impracticable, and produces no useful result at all to the consumer, that we are here asking Parliament to remove that restriction as to the sulphur compounds. Now, sir, having told you how and why it came into the Bill, there being no restrictions before, I shall trouble the committee with a few observations as to what these sulphur compounds are, and how they come to be present in the gas which is manufactured for commerce. Roughly speaking, the manufacture of coal gas is carried on by distilling the coal in sealed vessels called retorts, exposing them for some time—six or seven hours—to a bright red heat, the effect of which is to send off a portion of that which is within the retort in the shape of volatile matters, leaving behind the residuum, which we all know as coke. These volatile matters, the product of distillation, contain tar and ammoniacal liquor, which, the moment the vapour cools, condense and become liquid; but in the gas which remains there are certain foreign substances—perhaps I may call them impurities—and those impurities may be classed as follows:—One is ammonia—there is a large quantity of ammonia; secondly, there is a large quantity of carbonic acid; thirdly, there is sulphuretted hydrogen; and fourthly, there is the presence of what are called "other sulphur compounds," which are not exactly determined by the resources of chemistry up to the present moment, but which are known as sulphide of carbon. The ammonia in the gas is partly extracted; its presence can be detected exceedingly easily by litmus or turmeric paper—that is one test for it—and it is removed from the gas by the processes called washing and scrubbing, to which the gas is subjected—that is to say, by treating it with water in certain vessels called washers and scrubbers. The presence of ammonia is not objectionable in one respect; but it is objectionable to gas manufacturers, because its presence tends to decrease the illuminating power. If you get a large quantity of ammonia in your gas you get less illuminating power, so that if you have an excess of ammonia, what you have to do is to put more cannel into the retort, and thus increase the lighting power of the gas. Ammonia itself is productive of no particular nuisance. The presence of carbonic acid is very easily ascertained. You have only to take a little clear lime water, send the gas through it, and if there is carbonic acid you turn it milky white, and make the water quite cloudy—that is very easy, and there is no difficulty at all in removing it. Then there is the sulphuretted hydrogen. Now, sulphuretted hydrogen, as we all know, is an exceedingly foul and offensive gas. It is a gas which, wherever it exits, creates great nuisance and inconvenience, and while it is always present in crude gas as manufactured and produced in the retort, it never is, or never ought to be, present in the purified gas delivered to the consumer. It can be got rid of by proper means of purification, and practically it always is got rid of; so that that remote quantity which an analyst calls a trace—which, I believe, means, in chemical language, enough to satisfy him that it is there present, but in a quantity which is inappreciable—does not exist, or scarcely ever exists in the gas as it is delivered to the consumer. It can be removed, or used to be removed, by lime; but some years ago it was discovered that a substance called hydrated peroxide of iron, under proper conditions, entirely absorbs the whole of this deleterious sulphuretted hydrogen, and when the gas is purified by the process of the peroxide of iron, the sulphur becomes precipitated in it, or, rather, comes into it in a solid form, and I believe modern science has shown a means of extracting it from the oxide, so that the oxide becomes available for use again, and chemists have shown the manufacturers how to avail themselves of the sulphur thus extracted from the gas. Now, sir, I have dealt with all the impurities found in the gas delivered from the purifiers, except the sulphur products other than sulphuretted hydrogen. Those sulphur products were discovered by Dr. Letheby some 20 years ago, though their existence had been suspected for some time. They are impurities which are not discoverable in crude gas, but which are given off only when the gas is burnt. Suppose you were to allow the gas to escape from a pipe, you would not detect them, or could not detect them chemically then. The only way in which, up to the present moment, they have been detected chemically, I believe, is by burning the gas at the rate of half a foot an hour for 20 hours in a closed chamber that contains the products of combustion. You will then find that there is undoubtedly present sulphide of carbon—that is the name given to it for want of a better distinction—and this body, and this body only, is that which is designated "other sulphur compounds" in the gas. It necessarily arises from the combustion of ordinary coal gas, and I believe that, as a matter of fact, between 30 or 40 grains—some 33 grains—is about the average in gas which is not purified from this substance. Now, sulphuretted hydrogen, as it is always a nuisance, is prohibited in various gas Acts, but to this day, except in the Metropolis, and a few places in the country, there is no limit and no restriction about these other sulphur compounds in the gas. At Birmingham and Manchester, and other great towns in the kingdom, where the municipalities supply their own gas, they are absolutely without limits in this respect. Paris, which is most particular, and where the most exhaustive scientific experiments have been made with regard to the presence of, and the alleged deleterious effects of these sulphur compounds in the gas, is also without a restriction. But in London the Referees have a power, within certain limits, to say how much of these "other sulphur compounds" shall be present in the gas. They have power to fix it between 30 grains and something less, but we are put—and I believe we are the sole instance almost in the kingdom (there may be two or three other cases)—we are put under the hard and fast line of 20 grains per 100 cubic feet of this impurity. I hope the committee will pardon me if I venture to call their attention to the extremely inappreciable quantity of this impurity in the gas. You see, if you turn to it at once, how misleading the matter really is—it is 20 grains (that is weight) per 100 cubic feet (which is volume), so that you are comparing weight with volume. It would be a much fairer comparison, I think, if you compared volume with volume, or weight with weight. Now, let me see what it is. One hundred cubic feet of gas weigh, taking it at the ordinary specific gravity, 22,500 grains, and the 20 grains of these "other sulphur compounds" that are allowed by the 17th section occupy ·0088 foot—that is, $\frac{88}{10000}$ths of a foot. Increase it to 40 grains and it is ·0018, or $\frac{18}{10000}$ths; which, of course, is almost inappreciable. I have stated it by weight. Now let me state it by volume. It would be 5 cubic feet in 10,000, or 1 in 2000. But now suppose there were 40 grains, which is the maximum almost that has ever been found after a large number of testings. These products, as I have told you, are only to be detected when the gas is consumed by combustion, and when the gas is so consumed they become a double quantity—that is to say, they produce 80 grains of sulphurous acid gas per 100 cubic feet, or just 1-15th portion of one cubic foot. So that to get one cubic foot of sulphurous acid gas, which will go easily into the crown of a man's hat, I have to burn 1500 cubic feet of the gas supplied. Now, when I have burnt 1500 cubic feet of the gas supplied as a necessary consequence of the combustion, it produces two things—vapour and carbonic acid; and, necessarily, the 1500 cubic feet of gas would produce 1000 cubic feet of carbonic acid, so that my one foot of sulphurous acid and vapour is diluted with 1000 times its volume of carbonic acid gas. Now there is another fact I may mention which may be known to you. An ordinary adult human being respires carbonic acid gas which is equivalent to two ordinary 3-feet gas-burners; and in the most crowded theatres, where the atmosphere has been analyzed, the amount of carbonic acid discovered by analysis is 0·32—rather less than a third—per cent.; and now what I have mixed with that quantity I have to divide by 1000, before, at 40 grains of sulphur impurity per 1000 feet of gas, I get any product of combustion that can possibly even include sulphur, whether deleterious or not. So you will have, from the most exact scientific evidence, that, even under the most unfavourable conditions, I have got it mixed with 1000 times its volume of carbonic acid, and I have got the whole of that in the proportion of one-half millionth in the volume of the atmosphere, and that is the worst result there possibly can be. Taking the maximum of carbonic acid that has ever been discovered under such unfavourable circumstances as I have mentioned, you are dealing with a matter which is so inappreciable as to be positively one half-millionth of the volume. If I have made these figures clear to you—and they will be spoken to by a very eminent gentleman indeed, Dr. Odling, whose calculation it is really (and he is one of those commissioners that we have heard mentioned, appointed as practically conversant with the make of gas)—if I have brought it home to you, the committee will see how small a quantity it is that we are dealing with—utterly inappreciable, you will find. I will not now detain you by going into other calculations, but I may state that we have had experiments made. There is one company in London who have always been held up as a model, and they have been to some extent a terror to other companies. They have been fortunate in having one of the ablest gentlemen connected with the manufacture of gas, taking an active part in the management; I mean the South Metropolitan. That company have supplied pure gas cheaply, and have carried out the process of gas manufacture so well as to be held up as the good child whom all others are to copy as an example. Mr. Livesey, the manager of those works, placed a room at the disposal of some eminent chemists whom I shall call before you, and in that room was burnt gas manufactured by his company, which had not been purified from any of the sulphur compounds, and contained between 33 and 35 grains per 100 cubic feet of them. That room was an ordinary room; it had a door, a fireplace, and two windows, and the gas was burnt there for hours, and, after about six hours of burning, the maximum amount of sulphur impurities found in the atmosphere, whether or not the burning were continued for a greater or less time, was this—it showed substantially this, that in an ordinary room where gas is burnt you may divide the atmosphere into three zones. There is one about 18 inches from the ceiling, caused by the heat of combustion, and is about 20 degrees above the ordinary temperature of the room. After about five or six hours burning the hydrometric conditions there are bad, and the bulb of the thermometer is very dry. At 18 inches down from the ceiling to about 5 feet six inches, or something of that sort, which is about the height of an ordinary individual, is the middle or temperate zone; and at 18 inches from the floor there is a third and distinct condition of the atmosphere. In the middle zone, in the most unfavourable conditions, burning gas without these impurities extracted, you would have to be shut up as close as possible, and have to respire that atmosphere, and nothing else, for five or six hours before there could possibly enter into the system one-tenth of a grain of sulphurous acid gas. Well now, sir, it may be common knowledge to all of us—certainly, if I may venture to say so, it was brought home to me personally in a peculiar manner—that the burners which are employed in our houses do not consume all the gas, and that a great deal of the annoyance found from the ordinary domestic use of gas is because a great quantity of the gas that is delivered from the pipe escapes into the atmosphere of the room without being consumed. I have heard in these rooms, over and over again, by scientific witnesses, that a perfect burner, if you can get it—an ideal model burner—is so to regulate the combustion of gas behind it, that, at the point of combustion, where the spark comes to the gas, you have no pressure; that is to say, that the flame consumes all the gas as it is delivered, and none escapes into the atmosphere unconsumed. As to any of these sulphur compounds that escape into the atmosphere unconsumed, there positively is no question, and could have been no question, because they cannot be detected even by analysis, and it cannot be suggested that they cause practical inconvenience to a single human being, or damage to a single farthing's worth of property. All these calculations I have been giving you, and all these minute quantities, are upon the supposition that the gas is absolutely and perfectly consumed, which we know it really is not. But if you take into consideration that in all places where gas is burnt, where the ventilation is good and sufficient, there is positively no inconvenience felt, and the presence of these sulphur compounds cannot be detected, or, if detected, only in the minute proportion which chemists call a trace; so that, if gas is burnt under ordinary and fair conditions, the presence of these sulphur compounds is absolutely immaterial, and if it is burnt even for the purpose of satisfying the chemist as to what amount of sulphur he possibly can get, it comes to so small a proportion as to be practically inappreciable. Still, although most minute, if it is noxious and hurtful, it should be removed at any cost if it can be. But I state broadly, in the presence of those in authority (the Metropolitan Board of Works here), that the researches of chemistry show that even in a laboratory test you cannot remove it. It is utterly impossible to remove; and, in the practical working, such as is necessary in the manufacture of gas, all that you can do, by the best means at present devised by the most eminent chemists, is to take out from something between 30 to 40 grains per 100 cubic feet of gas, so as to reduce it to something under 20 grains. That is all you can do. You can remove from one-fifteenth to one-tenth of the quantity there present. Now, in order to do that, let me tell you what is to be done. You have to resort to lime purification. Formerly all gas was purified by lime. When the properties of oxide of iron were discovered, it was had recourse to, partly only at first, because there was a patent, and it was protected by royalties, out of which arose litigation. But the result of working by lime is this: In removing the impurities of gas, the lime employed becomes exceedingly foul and exceedingly

offensive. The ordinary way in which purification is accomplished is first to pass the gas through purifiers, in which the lime is put on trays. You take out the carbonic acid by the first, and by the second you take out the sulphuretted hydrogen. It has been found that, after this, the objectionable bisulphide of carbon, or sulphide of carbon, exists in the gas, and the only way of removing the small quantity that practically can be removed is to expose the gas to the action of dry lime already saturated with sulphuretted hydrogen. First of all the gas is passed over the lime, to remove the sulphuretted hydrogen, and then the lime, which is thoroughly saturated with sulphuretted hydrogen, and is in the foulest and most objectionable condition that it possibly can be, has a chemical affinity for these "other sulphur compounds." But, in order that it may thus act upon the "other sulphur compounds," you have to keep it in this foul and highly objectionable state, and when, ultimately, you discharge these lime purifiers, you create an enormous nuisance in the neighbourhood—I say nothing of the men.

The CHAIRMAN: Will you allow me to interrupt you? I thought you spoke of a second tray of lime, by which the sulphurous particles were extracted, but now I think you say it is the same.

Mr. PHILBRICK: No; the first purifier removes the carbonic acid, the second the sulphuretted hydrogen. If you will allow me, I will just mention how it is done. I think there are two vessels, which are lime purifiers, and which have trays of lime in them—several trays of lime in each. The lime is spread so as to afford the greatest amount of surface for the gas to travel over. The first of these processes adopted by us removes the carbonic acid, and the second removes the sulphuretted hydrogen, and being saturated with it, it acts upon these other obscure sulphur compounds. Then a third tray is filled with the oxide of iron, and that removes the residue of the sulphuretted hydrogen; and we must do that, because, keeping the second tray charged to the full, saturated with sulphuretted hydrogen, it does not remove any of the sulphuretted hydrogen that after that period of saturation passes over it. If once you have got it fully saturated, then all it does is to take the other sulphur compounds, and you must treat it with oxide of iron afterwards, to get the sulphuretted hydrogen from it. I say nothing of the offensive nature of the lime which has to be removed from that purifier by the men; it is difficult to get them to do it—the suffering they have to undergo physically is very great; but the nuisance to the neighbourhood is something tremendous. It is naturally complained of wherever it exists, and it is so great that the lime process of purification cannot practically be resorted to in any crowded city, or near any city. But further than that, I ought to mention that there is a most expensive process resorted to by this particular company, in order to get rid of these other sulphur compounds. We can get rid of all the other impurities, but since the presence of these other sulphur compounds has been restricted, the effect upon this company has been to add as much, I think, as 2d. per 1000 cubic feet of gas to the actual cost of production, during the three years which have elapsed since the Act of 1873 has been in force; and when we have studiously endeavoured to carry out the requirements of the Legislature, it has averaged over a penny. But during the last year the necessity for the extended use of the lime has been so great that it certainly costs the consumer 2d. at least per 1000 feet more for gas, and in actual amount of cost in the purification you will find that it really costs us, per ton of coal carbonized—which is the unit that they use in gas manufacture—5d. more; the figures are 2¾d. (I am not going to decimals) as against 7¾d.; and, in addition, we have this foul compound, the very presence of which is a nuisance, and the removal of which is complained of by the neighbours and the neighbourhood at large, and we have to pay for removing it. It has to be carted or taken away by truck, and I believe it is useful for no purpose whatever. The lime can only be used once, and when once it is fouled it is got rid of as an offensive compound. I believe, in the case of the Chartered Company, they send it out to sea at a vast expense; but I will not anticipate their case. We have to get ours taken away; and it costs us 5s. a ton to get it taken away into the country, and that entails a cost which is of considerable importance—something like £250 to £300 a year. Let me be very frank with the committee, as far as I can, in this matter. I agree that these sulphur compounds are objectionable, and, if we can get rid of them, they should be removed; but the question is, what harm do they do? what is the cost of getting rid of them? and what is the necessity for removing them? and what is the trouble they cause? Let me tell you, as far as we can ascertain, it never has been alleged, even by Dr. Letheby, who discovered its presence, or by any of the eminent chemists or gentlemen who have been consulted on the point, or who have given their attention to the matter, that, with regard to the health of the community itself, the presence of this infinitesimal quantity is at all objectionable or deleterious. That never has been alleged.

The CHAIRMAN: Do you mean the 20 grains, or the 30 grains, or the 40 grains?

Mr. PHILBRICK: Even 40 have never been alleged to be injurious. I desire to adhere to the largest number at once. It has never been alleged that the presence of those other sulphur compounds has been at all objectionable, and I should be much astonished to hear it alleged in this committee-room. I do not think it can, in the face of all the scientific knowledge which has been applied to this subject. It is said that the choky sensation of an ill-ventilated room where gas is burning under proper conditions is due to these "other sulphur compounds." That is absolutely without proof, and is insusceptible of proof; it is only carbonic acid and the perfect combustion of gas. The carbonic acid being produced by the burning of gas gives rise to that sensation of heat and *malaise* that one feels in a badly-ventilated room. But then it is said that it destroys and tarnishes the gilding of rooms, the gilding of mirrors and picture frames, and the picture-rods round the tops of the rooms, and so on. All I can say with regard to that is this—and you will have positive evidence upon that point—that it is the heat in the air that I referred to, which generally causes the rot of the gilding of rooms, and the nuisance which is occasioned by the gilt tarnishing in the upper portion of the room. If any of the members that I have the honour to address may recollect, there was a great question some years ago about the library of the Athenæum Club, which is a room lighted with gas, and I believe there is a library in that building also, in which books are stored, which is not lighted with gas—that is to say, in which the products of the combustion of gas do not come into the room itself. I think it is shielded off with glass shields, as I believe the gas is in the House of Commons; but it was discovered in the library of the Athenæum that the maximum amount of injury that had been caused was all in a certain portion of the bookcases; and when Mr. Layton, the eminent builder, went to examine, he found that the flue of the kitchen chimney went up there, and that, almost entirely, the bulk of the mischief was in the books where the heat went. He could trace the course of the chimney by the leather of the books having perished. Well, but it has been said: "Oh, in other cases sulphuric acid has been found." Now, sulphuric acid, or oil of vitriol, is a very objectionable thing, and I am told (I am not chemist enough to understand it practically myself) it can always be produced where you have sulphur and water and combustion under certain conditions. I believe, in any very large city where coal is burnt, there is a trace, more or less, of sulphurous acid, and, sometimes, sulphuric acid; but that there is any sulphuric acid in these sulphur compounds I believe will be denied. It has been said that when you see the binding of a book perished you can taste the acid with your tongue. It is a most amusing thing if that be so, because practically in bookbinding they do use acid for the purpose of bringing about on the leather certain colours, applying certain pigments to them as mordants, and certain other books which were said to be affected and prejudiced did not contain a taste of acid; so that, in all probability, the acid which was supposed to have been detected would be rather that which was used in the original binding of the book. Otherwise, there is no reason why Gibbon's "Decline and Fall" should exhibit the acid, while Macaulay's "History of England," side by side, should not have the acid. Under these circumstances, we believe most thoroughly, from all our inquiries, and all the evidence we can produce, that there is really not a shadow of mischief to be attributed to this sulphur compound. People did not know what it was, and, therefore, they were afraid of it. Not the slightest injury can be alleged from the production of those sulphur compounds, even 40 grains in 100 cubic feet of gas. The mischief done is infinitesimal, and the labour, trouble, expense, and annoyance of creating a nuisance to the neighbourhood by the use of lime are so great that we feel that the restriction put into the Act in the way we describe would never have been there had all these facts been known, and had due consideration been given to them. We shall call Mr. Stevenson before you, who will explain his views. He is not ashamed to say that, having bestowed further attention on it, he is convinced that there are really not the slightest injurious effects produced by the presence of these sulphur compounds, and we shall ask the committee, when they have heard the case, to relieve us from this obligation, we at the same time putting ourselves under the limitation that in no case shall the sulphuretted hydrogen which is objectionable be present in the gas which we deliver to our consumers.

Mr. *George Livesey*, examined by Mr. PAULI.

I am a member of the Institution of Civil Engineers, and Past-President of the British Association of Gas Managers. I am engineer and secretary of the South Metropolitan Gas Company, and also a director of the Crystal Palace District Gas Company. In the manufacture of gas, the raw material—the coal—is placed in a retort, which is heated to a bright red heat, and the result is that the volatile matters are driven off by the heat, the volatile matters consisting of condensable tar and water, and other matters consisting of the illuminating gas and certain gaseous impurities, such as sulphuretted hydrogen, ammonia, carbonic acid, and other sulphur compounds. The coke is left in the retort, to be drawn at the expiration of five or six hours, when the gas has all been expelled, and the tar and water are condensed by simple cooling—by simply carrying the gas through a pipe exposed to the air, or carried under water. In this way they are removed mechanically. We then have to remove the gaseous impurities, which consist of ammonia, carbonic acid, sulphuretted hydrogen, and other sulphur compounds, which are principally sulphide of carbon. The ammonia is first removed, and, owing to its extreme affinity for water, it can be very readily removed by bringing it into contact with water only. The sulphuretted hydrogen—which is the most objectionable impurity, and, in fact, such an objectionable impurity that if it were left in the gas it would render the gas totally unfit for burning, and totally intolerable—was removed originally by the use of lime. Up to about 1850, or a little later than that, all the gas-works employed lime for the removal of sulphuretted hydrogen. This lime, when taken from the purifiers absorbed carbonic acid from the air, and sulphuretted hydrogen was evolved, causing a very objectionable stench in the neighbourhood. I lived near the gas-works—on the premises, in fact—in those early days, and can remember very numerous complaints that were made respecting this lime. In 1850, or thereabouts, it was discovered that sulphuretted hydrogen could be most effectually removed by means of hydrated peroxide of iron—a material which not only absorbs the sulphuretted hydrogen with great readiness, but also renders it perfectly innocuous. This material, on being taken out of the purifiers, is exposed to the air, and by that exposure it absorbs oxygen, which causes the sulphur or sulphuretted hydrogen which had been combined with it to be deposited as sulphur in a solid form. Exactly the reverse of that was the case with lime. The sulphuretted hydrogen by the lime process is driven off into the air; but with the oxide of iron process it is deposited in the solid form; and this oxide of iron, after a few days exposure, becomes what we describe as revivified, and fit for use again, and so can be used over and over for perhaps twelve months. The sulphur is not absolutely separated from it. We start, say, with 100 cubic yards of oxide of iron. Some of it is got from the bogs of Ireland, and some of it is artificially prepared. By putting it in the purifiers it absorbs a certain amount of sulphuretted hydrogen; then on exposure to the air that sulphuretted hydrogen is decomposed, and solid sulphur is deposited in the material. We then put it into the purifiers again and again and again; and at the expiration of about twelve months the 100 cubic yards become converted into 200 cubic yards. We then sell it to the sulphuric acid makers, who use it for making sulphuric acid, instead of purchasing sulphur or pyrites.

Mr. PAULI: I believe the removal of this sulphide of calcium is attended with considerable expense?

Witness: A very great expense. It costs the Crystal Palace Company 5s. per ton of coal carbonized. They have tried various means of getting rid of it, and after being complained of by the neighbours and the local authorities, creating a nuisance by depositing it either on their works or in other parts, they have been obliged to send it away by rail at a cost of 5s. per ton A further impurity is carbonic acid, which has this effect, that it diminishes the illuminating power of the gas—it has no other detrimental effect; but it may be advisable, in certain cases, to remove it by lime, or to substitute the use of a little cannel coal, which yields a richer kind of gas, and so brings up the quality. We may remove the carbonic acid, or we may increase the quality of the gas, and the result is the same. There is now a better plan of removing it than by the use of lime. Mr. Hills has invented a means of rendering the ammonia water caustic, converting the ammonia water from its crude state into a state of caustic ammonia, and this can be used, and is used by me at the South Metropolitan Gas-Works, for removing carbonic acid. This does not affect the sulphur question. It will ultimately affect it. The carbonic acid will bear very materially, ultimately, upon the sulphur question.

Mr. PAULI: Have you had practical experience of the nuisance of emptying these purifiers?

Witness: Yes, I have had, all my life, except when we used oxide of iron only. The nuisance is experienced a considerable distance from the works. I smelt it yesterday morning half a mile from our works in the Old Kent Road; commonly it extends further than that.

Mr. PAULI: With regard to the presence of ammonia, there is no difficulty whatever in ascertaining the existence of that?

Witness: It is just one of the simplest things possible. I have here, in this little case, a test for ammonia and sulphuretted hydrogen. It is simply a piece of blotting paper, saturated with acetate of lead; by wetting it, and exposing it to the gas, it will detect an infinitesimal quantity of sulphuretted hydrogen—considerably less than one grain in 100 feet of gas. This yellow paper is a paper saturated with turmeric, and by exposing it to the gas, it will detect as small a quantity as two

grains of ammonia in 100 feet, by turning red. So that the test for those impurities is of the readiest and most sensitive character, and can be applied at any moment.

Mr. Pauli: And for carbonic acid the test is equally simple, I believe?

Witness: For carbonic acid a little clear lime water is put into a small vessel, and the gas allowed to bubble through it for perhaps a minute; and if carbonic acid is present, the water becomes cloudy.

Mr. Pauli: With regard to those other sulphur compounds in their gaseous state, can their presence in the gas be detected?

Witness: There are no direct means of testing for those other sulphur compounds. The old plan was to burn a jet of gas under very peculiar conditions for perhaps 20 hours, and condensing the products of combustion with an alkali. The products of combustion were then analyzed for sulphur. It was a very long process, and we are indebted to Mr. Vernon Harcourt, one of the Referees, for a much simpler means. This, however, is not a direct method. By heating the gas to a certain temperature—I do not know the exact temperature, but perhaps 400° or 500°—he converts the sulphur compounds into sulphuretted hydrogen, and then by testing with this lead paper, he can detect their presence. The tests for ammonia, carbonic acid, and sulphuretted hydrogen are absolutely reliable—perfect you may say; but the same cannot be said of the test for the other sulphur compounds. Those tests seem to vary in a most unaccountable manner. I may give an instance of tests made at different places upon the same gas, tests made about six weeks ago at the South Metropolitan Works, and the tests made by the official tester. We had 29 grains in 100 feet at the works, and the official tester gave a return of 42. I can only account for the difference (and other experience has gone to prove the truth of this) by the possibility of these sulphur compounds being absorbed or arrested, by accidental causes for a time, by the pipe through which the gas flowed, and then, under other circumstances, being carried on by the gas. And a further proof of that is this. For the purposes of this inquiry I had a special quantity of gas made and purified by oxide of iron only—that is, purified from ammonia, sulphuretted hydrogen, and partially from carbonic acid; but the sulphur compounds were left untouched. That gas was stored in a separate gasholder, to the extent of about 400,000 feet. Dr. Odling and Dr. Russell have been making experiments on that gas during the last three months; the gas has been tested daily for sulphur compounds; one day it would be 26 grains, and another day it would be 39. I therefore thought that the great length of pipe through which it travelled—namely, 200 feet—might be the cause of it, and I had a pipe put direct into the gasholder and conveyed into the testing-room, and then I found there were variations, not to so great an extent, but very nearly; and the only conclusion I can come to is this, that the pipe absorbed or arrested something of the sulphur on some days, and gave it up on others. It was found uniformly to be the case that when the flow of the gas through the pipe was at the rate of half a foot an hour, the results were small—about 30 grains, or perhaps a little less; but that when the flow of gas through the pipe was at the rate of 15 or 20 feet an hour, we got 35 to 39 grains.

Mr. Pauli: Have there been any cases in which companies, without the use of lime, have attempted to purify their gas from the other sulphur compounds?

Witness: There have been numerous attempts made to purify it, but they have all failed; nothing but lime will do it at all.

Mr. Pauli: Is it correct to say that you cannot attempt even to purify gas from the other sulphur compounds without the use of lime?

Witness: Undoubtedly.

Mr. Pauli: And it is equally undoubted that you cannot use lime without being a nuisance?

Witness: It is undoubted.

Mr. Pauli: And I believe in those cases where it has been attempted without the use of lime, to purify the gas from sulphur compounds, it has only been done with a certain class of coal at a greatly increased cost?

Witness: There have been instances where companies have supplied gas containing a comparatively small quantity of sulphur without the use of lime. For instance, at the late City Gas-Works, Mr. Mann, the engineer, for a number of years maintained his sulphur at something very little over 20 grains in 100 feet, and even then there were the same discrepancies of testing. Mr. Keates tested for the company on the works, and Dr. Letheby tested for the Corporation in the City; and I believe their results never agreed. But it is possible to get a coal which yields a comparatively small amount of sulphur compound. On one occasion the South Metropolitan Company got a coal of this sort, and used it for twelve months. The quantity of sulphur amounted to not much over 20 grains, but the yield of gas was 900 feet per ton less than from the ordinary Newcastle coals. Moreover, the collieries which supply the coal yielding this small quantity of sulphur are so few and so small that it is absolutely impossible to get that coal as a general thing.

Mr. Pauli: Is it a fact that, where lime is used, in many cases the lime will give out the greater part of the sulphur that is previously absorbed?

Witness: That is just what it does do on exposure to air.

Mr. Pauli: Will you tell me about the discovery of these sulphur compounds?

Witness: A little over 20 years ago, I believe, they were absolutely unknown, and their existence was unsuspected until something like 20 or 25 years ago. Dr. Letheby, after being appointed by the corporation as analyst of their gas, discovered, by analyzing the products of combustion resulting from gas, that there was a certain amount of sulphur that was undetected by ordinary tests.

Mr. Pauli: Then, I believe, after his discovery, which was publishe d there was a kind of panic among gas consumers; they had an idea that they were all being poisoned by some unknown compound?

Witness: I suppose they did; at any rate, there was a great deal made of it; and, of course, it being perfectly well known that in a room lighted with gas there is a certain oppressiveness felt, and a certain disagreeableness in the air, the conclusion was jumped to that it must be these newly discovered sulphur compounds.

Mr. Pauli: And was it this outcry against sulphur compounds which induced the Legislature to inquire into the matter, and to try and fix some maximum?

Witness: By the Metropolis Gas Act of 1860, the Legislature imposed a limit of 20 grains upon the companies, and, in fact, took "a leap in the dark." Nobody knew how to deal with it; and that Act to the present day is a dead letter. Three of the large companies, supplying nearly all the south of London, are under that Act at this very moment, and the vestries and parishes who have had authority to enforce the Act have never done it. They are the Phœnix, the London, and the Surrey Consumers.

Mr. Pauli: Now, the process of purification that you use is practically Mr. Patterson's, is it not?

Witness: The certain means of dealing with the sulphur compounds by means of lime is undoubtedly Mr. Patterson's plan. The old plan was to use oxide of iron in one set of purifiers—four purifiers, for instance—through which the gas passed in succession, in order to be perfectly secure that the gas was thoroughly purified. In order to deal with those sulphur compounds, you must have three sets of purifiers instead of one set. We are indebted to Mr. Patterson, one of the first Referees, for making it clear, and Dr. Odling also investigated the same thing about the same time. You must have one set of purifiers to remove all the carbonic acid, and another set of purifiers also charged with lime to absorb first the sulphuretted hydrogen, and then, when this lime has become saturated with sulphuretted hydrogen, it is in a condition to absorb the sulphur compounds. Then you must have a further set of purifiers to absorb the remaining sulphuretted hydrogen. When the lime is in the condition shown in the specimen produced, it is in a fit state for absorbing the sulphur compounds. That lime is saturated with sulphuretted hydrogen. This bottle contains some of the oxide before it is exposed to the gas. The other contains the same oxide which has been taken out of the purifier after purifying the gas. If this were spread out and exposed to the air for a few hours, it would become a brown colour, and ready for use again. This abominable stuff [pointing to the bottle containing foul lime] is of no use. There is a little smell from the oxide when the purifier is being emptied, but nothing appreciable.

Mr. Pauli: Just explain to the committee for one moment the difference between the purifiers with sulphide of calcium and oxide, when both are impregnated with sulphuretted hydrogen?

Witness: In removing the oxide you expose it to the air. I think I have explained that. In the one case the oxide absorbs the sulphuretted hydrogen, and deposits the sulphur in a solid form, and in the other the lime absorbs the carbonic acid, and the sulphuretted hydrogen is driven off into the air.

Mr. Pauli: With regard to the results of this very expensive and inconvenient mode of purification, what results have you obtained?

Witness: The results amount to something like this, that the sulphur compounds are diminished to little more than one-half. I have here the tests of the gas for sulphur compounds during 18 months—from July, 1870, to December, 1871—the first 18 months of the testing of the South Metropolitan gas, under the authority of the Referees. At that time no sulphur limit was fixed, and no lime whatever was used in the purification. There were during that time 415 tests made by the official tester, and the sulphur ranged from 25 to 42 grains in 100 feet; the average was 32 grains. The highest was 42·2, and the next highest was 40·5; it never exceeded 40 but on those two occasions. The lowest was 20, but I struck that out, as I believe there must have been an error. The next lowest was 24·9. You may say the range was from 25 to 42 when we used nothing but the oxide of iron, and the average was about 32 or 33.

Mr. Pauli: Do you consider that that reduction is at all compensated for by the trouble, cost, and nuisance involved?

Witness: I have hardly answered your question. The reduction is from an average of 35 to an average of a trifle under 20, and I certainly do not think it is worth the trouble and cost.

Mr. Pauli: Will you tell the committee the effect which the sulphuretted hydrogen or the sulphide of calcium has upon the men who enter the purifiers?

Witness: The effect upon the men is very objectionable. I have had men very often laid up for several days by temporary blindness. When the lime happens to be in a dusty condition it is exceedingly irritating to the eyes, and nostrils, and throat. If it is in a very wet state, it clings to their hands and makes them sore; in fact, I very often feel exceedingly sorry to be obliged to require the poor fellows to work in those lime purifiers. I have tried respirators and gloves, which are of no use; the lime destroys the gloves. I got some of Professor Tyndall's respirators, those with cotton wool, and the men could not draw sufficient air through them when at work. I think it is the dust that affects the eyes.

Mr. Pauli: Do you find that in a gas-lighted room there is any practical difference between gas that contains 35 grains of sulphur and gas that contains only 15 grains?

Witness: In my own house I burn gas rather lavishly; and having had experience during all my life of burning different sorts of gas, I have never been able to detect the slightest difference, whether the gas contains 40 grains or 10; and I have burnt it under those conditions repeatedly. The unpleasant feeling which everybody more or less experiences from gas has never been traced to sulphur. I have read everything that has been stated upon the subject, and I have never seen or heard such an assertion. An ordinary gas-burner, burning at the nominal rate of 5 cubic feet an hour, would be equal to something like 15 or 16 candles. A small room would have three burners going; and multiplying that by 15, it would be perfectly absurd to put 45 candles in such a room. Probably the heat and unpleasantness would be something like it is from the gas, if the same quantity of light were required. The difference between gas and candles is this, that you are obliged to have gas at a distance from you, whereas you can bring candles close to you, which will serve equally well with a very much smaller quantity of light. I know something respecting the alleged effects of this sulphur on binding leather and furniture. It has been said that it destroys leather and furniture. I remember the case of the Athenæum Club. I do not believe that there is any truth whatever in the assertion that the bindings of books are destroyed by the sulphur compounds in the gas. I think there are other things which would account for it far more satisfactorily. I attribute it to the excessive heat chiefly. Evidence has been given over and over again to show that books and furniture will suffer just as much in a room which is hot, and where there is no gas burnt, as in a room where gas is burnt plentifully.

Mr. Pauli: I would ask you one more question, which does not affect us much; but I believe before you had imposed upon you this liability, you used to find your life generally much more pleasant than it is now?

Witness: A director's life is not an unpleasant one anyhow, but a manager's is very different. In my business as engineer, I used to take the extremest delight in it, and I have often thought that I could not have found a more pleasant and suitable occupation; but since there has been the trouble about the sulphur, it is perfectly unendurable. Sometimes I cannot sleep, and cannot think of anything else.

Mr. Pauli: With regard to the limits which are imposed in large towns in England, is it not the fact that the principal towns, such as Manchester, Birmingham, &c., have no limit whatever?

Witness: It is. I was at Manchester last year, and made special inquiry upon that point. I was there, called in by the corporation, in conjunction with Mr. Hawksley and Mr. King, to advise them as to the selection of plans for new gas-works to make 10 million feet a day. There were 28 sets of plans exhibited, and the corporation would not say anything about the sulphur. I therefore made further inquiry, and ascertained that they did not intend to take any trouble whatever about it, and did not deal with the sulphur compounds at all. In Paris I made a special visit of inspection two years ago, and ascertained precisely the same thing.

Mr. Cripps: It will probably be convenient to the committee if I state, before cross-examining the witness, the course that I intend to take. This is now a small part of a large case which is to come before the committee. In that large case I am also engaged, and we have the assistance of a great number of eminent persons, and my learned friend, Sir Edmund Beckett. I do not intend to interfere with that case in the slightest degree by what takes place in this case. It would be to give the committee a great deal of trouble to hear the same evidence twice over, and, therefore, I decline

entirely, in this case, to go into any one of these scientific matters which we must then have at greater length, and with better means of discussing them than we have in this case. I shall have just a few general questions to ask this witness, and I will dismiss all this science entirely for the present. Of course I do not assent, for the present purpose, to any portion of it.

Cross-examined by Mr. CRIPPS: The Crystal Palace District Gas Company were not included in the Act of 1860, which prescribed 20 grains as the maximum amount of sulphur impurity. Until the appointment of the Referees, all the Metropolitan Companies were under that Act, and, during all that time, it was not lawful to exceed that maximum. If they did exceed it, the manufacturers were liable to penalties; but it was not observed—that I can state most positively. In 1868 the legislation in this respect, in reference to the Chartered Company, was exchanged for what is now the Referee legislation. Subsequently this system was applied to nearly all the north of London. The legislation of 1868 altered the limitation of 20 grains of sulphur in 100 feet in the Metropolis, and enacted that the proper quantity should be determined by the Referees; but I think I am entitled to give the reason for that. It was found to be utterly impossible to comply with the 20 grains legislation. There was nothing known about it, so the committee thought, or the promoters and opponents of the Bill thought between them, that it would be fair to remit it to a scientific body. The larger question has to be fought before this committee with regard to the Referee legislation, and to their prescription of the quantity of the sulphur to be allowed. The experiments which I and others have ventured on are in their relation similar to those which affect the larger question, because if the larger company win their case it will relieve me at the South Metropolitan works. The Crystal Palace District Company are not a little company, except by comparison. About half the area they supply is within the metropolitan district. I represent that company here.

Mr. CRIPPS: Do you state for the South Metropolitan Company that you have not been able to comply, and have not complied, with this regulation about the 20 grains of sulphur?

Witness: I stated that I have not been able to do it continuously and perfectly.

Mr. CRIPPS: But you have been able to do it generally?

Witness: I perhaps have by creating a nuisance.

Mr. CRIPPS: I hold in my hand a report made by the Chief Gas Examiner on the results of testing the gas of different companies. It is a report made to the Metropolitan Board of Works, and I find for the last quarter, or rather the quarter ended on Dec. 31, 1876, the average result of the testing of your company was only 17·7 grains in 100 cubic feet.

Witness: Quite right.

Mr. CRIPPS: Then you have complied with the regulations?

Witness: Yes. I may go back a little, as you have referred to these reports, and state that in December, 1875, my gas was ten times over the limit of 25 grains—the Referees allow 25 grains in the Metropolis during the six winter months, and 20 grains during the six summer months. In the latter part of November, and during the month of December, I was 14 times in excess of the 25 grains; in the month of January I was ten times in excess, and I am bound to say here that the Metropolitan Board have always acted most fairly and liberally in these matters. However, from the end of January, 1876, up to the end of February of this year we went on without a single excess, and then the excesses came on, and why they came on I never could find out. We went up to 42 grains.

By the COMMITTEE: There is a larger margin allowed in the winter than in the summer because of the greatly increased quantity of gas that is made. We make four times as much gas in December in one day as we do in June, and therefore there is greater difficulty in dealing with it.

Mr. MICHAEL: The reason is that the larger make of gas taxes your purifying power?

Witness: Yes. People burn more gas in winter. We went on all right for 14 months, and then there was an excess of sulphur on the 1st, 2nd, 3rd, and 5th of March; and I think there must have been on other days, but the testing office was shut up for repairs. I wrote to Dr. Williamson, the Chief Gas Examiner, and stated that there was something wrong, but I could not find out what it was; and here he quotes from me: "Though how or why, or to what extent, I am totally unable to say, unless the cold weather of last week had something to do with it." Then Dr. Williamson goes on: "A careful investigation of the circumstances of the case has brought to light evidence that portions of the lime in the purifiers have remained inactive, and I have reason to believe that the quality of the lime employed is subject to variations which affect its absorbent power."

Mr. CRIPPS: During the time that you have been under this restriction, and during the time that the metropolitan companies have been under this restriction, they have always claimed to divide 10 per cent.?

Witness: Yes, they have; but you know how it is.

Mr. CRIPPS: If the matter came to that, you could divide a little more in the South Metropolitan?

Witness: Yes; but you remember about the sliding scale.

Mr. CRIPPS: We will not go into all those matters now; but, however, you have managed to comply with the regulations and to divide 10 per cent., and could divide more?

Witness: Yes; our Act gave us the power to charge a price that would enable us to pay 10 per cent. That is altered now.

Mr. CRIPPS: Never mind what the Act gave you; your mode of making gas, as long as you are enabled legally to do it, does enable you to divide more than 10 per cent.?

Witness: Yes; it comes to this, that we make the consumer pay 2d. per 1000 for these things—perhaps 2d. per 1000 more than he would otherwise do. Why did not the Metropolitan Board insert the sulphur clause in their Bill when they proposed to have gas-works of their own?

Mr. PHILBRICK: Representing the consumers when they were bringing in a Bill to supply gas to London, I understand you that the Metropolitan Board of Works introduced their Bill without any limitation of this kind upon the purity of the gas?

Witness: They did; and every other corporation do the same.

The COMMITTEE: In what year was that?

Witness: That was 1875.

Mr. CRIPPS: That was merely a skeleton Bill introduced into Parliament.

Mr. MICHAEL: They wanted to reduce the companies to skeletons.

Re-examined by Mr. PHILBRICK: The Crystal Palace District Company supply a suburban district, and they have an absolute hard and fast limit of 20 grains in their Act; but in the Metropolis itself the companies which are under the Act of 1868 have no limit, but it is left to the discretion of the Referees. Originally the Referees fixed the sulphur limit at 30 grains, then it was reduced to 25 grains in winter and 20 in summer. We are therefore absolutely worse off in the suburban district than the great metropolitan companies are, because during the whole year we have the extreme limit put upon us which is put upon them in the summer time, when gas is easier to manufacture, and there is more time to purify it.

Mr. PHILBRICK: Now I do not want to go into other matters; but my learned friend, Mr. Cripps, asked you this: He said that the South Metropolitan could comply with the requirements of the Act, and yet divide 10 per cent. Are there circumstances connected with the history of your South Metropolitan Company which render you peculiarly situated with reference to your capital and to your dividend over every other company in the Metropolis?

Witness: Yes; and it simply comes to this, that we are allowed to charge a price for our gas which is sufficient to cover the cost of making it and to pay a 10 per cent. dividend, and it also covers the extra cost of lime purification. So that it becomes a question in this way, that if lime purification is more expensive, it is a matter which the unfortunate consumer has to pay for. The Crystal Palace District Gas Company are not a 10 per cent. company. They have £50,000 at 10 per cent., and the rest at 7 per cent. and 6 per cent. And although they have a maximum price of 6s., they keep the gas at 3s. 11d., and reduce it a penny when they can.

Mr. COURTNEY: Would the increased difficulty of testing this gas in winter, on account of the greater amount required, apply as much to the Crystal Palace Company as it does to any metropolitan company?

Witness: Yes, because their apparatus is in full proportion to their works, and there is a greater difficulty, especially in the depth of winter, because there is always a pressure on gas companies. We work at our full power.

Mr. COURTNEY: Is this process of purifying by hydrated peroxide of iron a very expensive one, as compared with purification by lime?

Witness: It was, when it was first introduced, just about as costly as lime, but the improvements that have been made have brought down the cost, so that, in some companies, they purify their gas really for nothing—it does not cost a halfpenny per 1000 feet. The value of the spent oxide is as much as the material in the first instance. You may buy fresh oxide at, perhaps, 50s. per ton, and when it is doubled in bulk you sell it at 25s. per ton.

Mr. COURTNEY: The process with the hydrated peroxide is not at all open to the disadvantages of disagreeable smell and injury?

Witness: The only objection that has ever been urged to the oxide of iron process is, that it does not attack the sulphur compounds other than the sulphuretted hydrogen. On all other grounds it is undoubtedly and undeniably the best.

Mr. COURTNEY: Besides the injury to the eyes and hands of the men by the actual contact of solid lime in the process of purifying by lime, do you think that the vapour given out, which produces the disagreeable smell, is injurious to human beings—to health?

Witness: I have been amongst it all my life, and I cannot say that the smell is injurious. The workmen are mostly engaged in the air in these processes. There is free circulation of air; so that I do not think their health is injuriously affected by the emanations, except so far as contact with the solid lime.

Mr. COURTNEY: The Crystal Palace Company are under the same limitations as the metropolitan companies were under before 1868?

Witness: Precisely. The limitation was imposed in respect of this company in 1873. It was made in the case of the metropolitan companies because the Act of 1860 was totally inoperative; and it was utterly impossible for the committee to settle what should be the proper limit, therefore it was remitted to the Referees to investigate.

Mr. COURTNEY: You do not think it necessary to have any limit?

Witness: By the use of oxide of iron the quantity of sulphur in the gas will not exceed these 40 grains, and, therefore, I think the limit is unnecessary; but if any limit is imposed, we should probably have to use a portion of lime, and that would not be a small portion, because the whole of the carbonic acid having to be removed first, we should have nearly as large a use of lime if we were limited to 35 grains as if we were limited to 25. Moreover, if you use lime you get sometimes less excesses; for instance, the Crystal Palace Company, on one occasion, when they used lime, had 49 grains, and they were prosecuted by the Lewisham Local Board for it. That was entirely owing to the carbonic acid in the gas driving off some of the sulphur compounds that had been absorbed by this lime, and sending them on with the gas. The lime absorbs them, but it holds them with a very feeble affinity; and if I passed a stream of carbonic acid into this bottle, you would have those sulphur compounds driven off largely.

Mr. *George Wilson Stevenson*, examined by Mr. MICHAEL.

I am a gas engineer, carrying on business in Westminster, and have had large experience in gas undertakings. For the past ten years I have been consulted by the Corporation of London and the Metropolitan Board of Works upon all questions affecting the supply of gas in the Metropolis. I know the works of the promoters, and the district supplied by them, and the Acts under which they are authorized to supply gas. I have read the Bill which is now under the consideration of the committee. I know pretty well section 17 of the Act of 1873, which the Bill seeks to repeal. I gave evidence upon the Bill in 1873. At that time very little was known with certainty as to the cost and inconvenience attending the purification of gas from sulphur compounds other than sulphuretted hydrogen. Since 1873 there has been a very large amount of inquiry, and a very considerably augmented knowledge as to these sulphur compounds. Nothing even now is exactly known as to the conditions in which they exist in gas, or a precise and scientific determination of the quantity. From time to time the same gas, tested in exactly the same mode, will give different results. The best means of taking out the sulphur compounds, I believe, are not yet known. I gave evidence as engineer in favour of the Bill of 1873, and was cross-examined by Mr. Philbrick, who then represented the Metropolitan Board of Works, on the general question of impurities in gas. In re-examination I stated that I thought 20 grains might be inserted, and upon that, without any question, it not having been asked at all of me in cross-examination, the promoters of the Bill at once assented to put in 20 grains as the limit. There was no discussion about the 20 grains; it was merely because I at that time stated from my knowledge up to that time that 20 grains might safely be inserted. If I had had the knowledge I have at the present time, I should not have stated that 20 grains was a safe limit to put in. I could not have done so. There has been no department of gas manufacture which has been submitted to more critical inquiry the last few years than the purification of gas, and we have knowledge now in regard to the cost, inconvenience, and nuisance occasioned by the elimination of sulphur compounds that we had not a few years ago; and with my present knowledge I could not say that 20 grains of sulphur, other than sulphuretted hydrogen, is the proper limit to impose upon a gas company. At the present time there are no other means known which can be used practically for taking out the sulphur compounds, other than sulphuretted hydrogen, except the use of lime, and that, too, in its most foul state—in a state of sulphide of calcium. That being so, in my opinion it was almost inevitable that a nuisance, and a nuisance of a very considerable extent, must be created by such a mode of purification. The lime is used in a very foul state—it is made foul in large quantities—it has to be removed from the purifiers by manual labour; and then, unless a river carriage is available, as it is at some stations, where they can put it into barges immediately, and cover it with tarpauling, or with some deodorent, the foul lime has to be put into carts or railway vans, and everybody who comes near it, or into whose neighbourhood it is

brought, complains of the nuisance. It is a deleterious matter to deal with on the part of the workmen who are engaged in the process; it injures their hands and their sight, and produces nausea.

Mr. MICHAEL: Previously to the introduction of hydrated oxide of iron as a means of purification, lime was the purifying agent employed, I think?

Witness: Yes; I can remember when milk of lime was employed, and it resulted in what was called "Blue Billy;" and a very valuable mode of purification it was, except for the nuisance it created. It was on account of that nuisance that chemists so ardently sought for some other means of purification to avoid the use of lime. It was on that account also that oxide of iron was hailed as a great boon, as it entirely superseded the use of lime as a means of purification from sulphuretted hydrogen. No sulphuretted hydrogen is under any circumstances permitted in gas. It is an injurious compound, and is strictly prohibited and most carefully guarded against in every well-conducted works. There is no proposition in the present Bill that any sulphuretted hydrogen should be allowed. The Gas-Works Clauses Act, 1871, which is the general legislation on the subject, prescribes an entire freedom from sulphuretted hydrogen, and except for a special provision in a special Act, the general legislation does not provide for the removal of any other sulphur compound than that. The Board of Trade have passed, I think, some seventy Provisional Orders since 1871, which have been confirmed by Parliament, for the regulation of gas companies in the provinces, and in not one of those is there any other restriction with regard to sulphur than the complete elimination of sulphuretted hydrogen. The last of these was in 1876.

Mr. MICHAEL: You are very well acquainted with the Acts which have been passed for transferring undertakings from companies to corporations and local authorities and urban sanitary authorities through the country?

Witness: I am. In none of them, as far as I know, has any such restriction been inserted. I am very largely engaged in advising gas companies through the country. I do not know of any such limitation as 20 grains of sulphur being imposed in any of the Acts which have been recently passed for regulating provincial undertakings. There have been three Acts passed of late years with a 30 grains maximum only. One is the Act of the British Gas Company, at Norwich, the year before last; and another, the British Gaslight Company, at Hull, last year; and there is a third, the name of which I have not here, but which was either in 1873, or since 1873. Each of them has a limit of 30 grains.

Examination continued: I have been engaged by vestries to advise them upon this subject as against the gas companies of the Metropolis. I was engaged by the Vestry of St. Luke's, Chelsea, to advise them in regard to an alleged nuisance arising from the Fulham works. I do not know that we could trace sulphuretted hydrogen 700 or 800 yards, but the stink from the works was distinctly perceptible at 700 or 800 yards in the direction in which the wind blew; and, upon a detailed investigation, it was found to be perceptible only at times, when the lime purifiers were being changed at the works. The company take every possible means to obviate the nuisance by transferring the lime as quickly as possible into trucks, which are covered over with breeze—that is, very small coal dust—so as to prevent the escape of these noxious vapours; and then those trucks are taken down a short incline and tipped into barges, and the same process is gone through of covering the spent lime with coal dust or breeze, and subsequently it is covered with tarpauling; but, notwithstanding all that precaution, the inhabitants are very much annoyed, and will always remain so, as long as this system of purification is adopted. I believe the company adopt the best means; and I was compelled to report that, in my opinion, they could do no more than they are doing to avoid creating a nuisance. No gas company could have done more. The Crystal Palace Gas Company could not do more than they do now, in my opinion, to prevent a nuisance. With the most scrupulous care, the use of lime must create a nuisance. The employment of lime in purification, as compared with oxide of iron, is as 1¼d to ¼d., or five times as much. In this company it amounts to £1500 annually, which comes out of the pockets of the consumers, as they would otherwise be able to supply gas 1d. per 1000 cheaper. But I do not look at the money part of the question itself; it is the irremediable and irreparable nuisance which is the evil in this matter. If it came to a question of money, the gas company, if it really was essential, must bear the cost, whatever it might be. Throughout the very large district supplied by the Manchester Corporation the gas is sent out with as much sulphur in it as it naturally contains, after being purified only by oxide of iron. The gas there is of 20-candle illuminating power. I have never seen any bad results attributable to sulphur in gas supplied by corporations under the same circumstances as Manchester or Birmingham. I have never heard a complaint. At Paris the same circumstances prevail. I do not know what is done at Madrid, but I had the supply of Oporto myself some years ago, and I used only oxide of iron. I have never seen, in my experience—which is very large—as a gas engineer, any bad results occur either to person or property from such a quantity of sulphur in the gas as may be left after purification by oxide of iron, and that alone. I do not believe that any bad results could occur. I was the engineer with Sir Joseph Bazalgette, for the new gas-works proposed to be erected by the Metropolitan Board of Works, in 1875, and I had to do with the preparation of that Bill, which was a Bill complete in all its parts. It was very carefully considered by me, and in that I depended chiefly upon the general law of purification, and put in no special clause other than general legislation had provided. The Metropolitan Board of Works and the Corporation of London, I think, very wisely did what the Board of Trade have done, and all other municipal authorities—that is, they depended upon the supply of sufficiently pure gas when sulphuretted hydrogen only was eliminated.

Mr. MICHAEL: In your experience, and in your opinion, are there any circumstances in the district supplied by the Crystal Palace District Company which call for special legislation upon these points?

Witness: If exceptional legislation were desirable with regard to the Crystal Palace, it would be in the direction of enabling them to create as little nuisance as possible, and at present, by the terms imposed upon them, they are obliged to create a greater nuisance than even the South Metropolitan Gas Company. Those works are situated in the Old Kent Road—not the most delightful neighbourhood in the world—but the Crystal Palace District Gas-Works are situated really in a district among villas and good residences, where it is important that a nuisance should not be created. If the existing obligations were removed, no nuisance could arise from the conduct of the gas company. The effect would be to simply remit the company to the operation of the general law, which I think is quite sufficient to protect all consumers.

The CHAIRMAN: As far as I gather from the evidence which you have given, if you want to reduce sulphur 20 grains you are obliged to use lime.

Witness: Yes.

The CHAIRMAN: But with oxide of iron you can reduce it say, generally, to about 30 grains?

Witness: 30 to 35. Not 30. A limitation of 30 would not materially help the company. They would then be obliged to use lime in such a quantity as to create a nuisance, although not a nuisance to the extent which they now create. From 35 to 40 grains of sulphur is what is left in gas after purification by oxide of iron. In cannel districts it is more.

Cross-examined by Mr. O'HARA: In towns and populous places there is a difference in the provision with respect to the purification of gas, but I do not think there ought to be. I do not think it is of the same importance whether a nuisance is created in an agricultural or a district built upon. There are plenty of places—in Lincolnshire, for instance, in the Fens and other places—where they might use lime, to any extent almost, without it being a nuisance; in fact, it would rather be an advantage than otherwise to take lime there. I know at York they sell the spent lime at 5s. per ton. But this does not lead me to say that general legislation would be inapplicable in another place where a different state of things prevailed. With regard to sulphur compounds, I think the present legislation is very wise indeed in regard to the purification of the gas; that is, that it should be entirely free from sulphuretted hydrogen. That is a state of things that is applicable to all districts. I was concerned in advising the Metropolitan Board of Works and the Corporation of London in a Bill which took the form of what was called a Regulation Bill. It was first heard before Mr. Forster's committee, and then again taken up last year and passed. That Bill referred the whole question of sulphur impurity to three Referees, who were to be appointed by the Board of Trade, and I am not surprised that the Metropolitan Board, or anybody else, wanted to get rid of the question; it was one upon which there was very great disagreement. The clause inserted in the Bill was, "The Gas Referees shall from time to time ascertain with what degree of purity each gas company can reasonably be required to make and supply gas continuously without occasioning a nuisance to the neighbourhood in which the works are situate, and shall thereupon prescribe and certify the maximum amount of impurity in each form with which gas supplied by such gas company shall be allowed to be charged, and the time from which the allowance thereof shall be enforced as against such gas company, regard being had to the necessity for any alteration of works by such gas company consequent on any such certificate." I approved of that clause as far as I was consulted upon it, but it is more a chemist's question than an engineer's; I had not much to do with it. I think it a very wise provision.

The CHAIRMAN: Does the authority of the Referees apply to all the impurities as well as to the sulphur compounds?

Mr. O'HARA: To the sulphur compounds and ammonia.

Mr. MICHAEL: It refers, in fact, to any impurity.

Mr. O'HARA: Take it generally, it means any impurity other than sulphuretted hydrogen, because that is interdicted altogether.

Cross-examination continued: In Bills transferring the works of gas companies to corporations, I have never seen any clause dealing with the question of purity. In the Bill to enable the Metropolitan Board of Works and the Corporation of London to supply gas, there was no such clause, and I did not advise one.

Mr. O'HARA: Was not the reason of that, that where this interdiction comes into the hands of the local authorities they are the representatives of the people, and the people can put the screw on them if they do not give the gas which they ought to do?

Witness: That is very plausible, but it is utterly impossible for the consumers to know whether they are burning gas with 5 grains of sulphur or 50. I will defy any consumer to tell whether he has 5 grains or 50 in his gas; 50 grains in 100 feet of gas will not corrode silver, or leather either.

Mr. O'HARA: At all events, as a fact, these matters are left by the ratepayers and burgesses of towns to the local authorities?

Witness: They are, and the fact is that when gas-works or water-works are in the hands of the local authorities there is very little complaint.

Mr. O'HARA: Supposing that the local authorities were to make default in following any prescribed regulation, and that default was accompanied with a penalty. Who would pay the penalty?

Witness: The ratepayers.

Mr. O'HARA: Then would it not be absurd in the ratepayers to be paying penalties out of their own money?

Witness: You may say so.

Mr. O'HARA: But is not that the reason? You know perfectly well, no one better; and no one can be more candid. Is not that one of the reasons why these clauses are not put into corporation Bills?

Witness: You are assuming that the ratepayers and the consumers are identical. They are not so; or, if they are as regards numbers, they are not as regards the degree. There is a good deal of fallacy in those arguments. I do not agree with you; I do not think they are identical.

Cross-examination continued: I suppose it is possible to disinfect the foul lime; it is a question of expense and space, and the possibility of subsequent nuisance. I think that gas cannot be purified by lime without producing a nuisance. The purifiers at Fulham are not small; I think they are amply large enough. If they were much larger the smell from them would not be considerably less. I remember the passing of the Act of 1860, but I was not concerned in it. That Act prescribed 20 grains of sulphur. By the Act of 1868 the limit was left to the Referees, because it was found that the limit prescribed in 1860 could not be kept within, and it is not now kept within by the companies still under that Act. I know what the maximum prescribed by the Referees is. It is 30 grains in winter and 20 in summer. I do not know that it is 15 in some places. For the Commercial Gas Company no limit has yet been fixed, because their new works have not been finished.

Mr. O'HARA: The Referees, in their printed Instructions, say, "For gas made at the works of the Commercial Gas Company it shall be 30 grains."

Witness: I have not seen that; it must be just out.

Cross-examination continued: I do not know as a fact what the average impurity at those works has been during the last six or eight months. I should not be at all surprised to hear that it has been kept down to 17·7 grains. There are times when it may be kept down to 10 or 11, but that is not the point at all. I do not mean to suggest for a moment that 20 or a less number of grains may not be attained. I was a witness for the Crystal Palace District Company in 1873. Since that time I have derived a great deal of information that I did not possess before, with regard to purification by lime and its cost, the space required for it, and the nuisance occasioned by the spent lime. It has not come suddenly upon me, but by degrees, as most information does. At Oporto my works were not far from the river, and I could very easily get rid of the lime, but gas was more costly to purify in that way, and I used oxide. The gas in Paris is not made from the same coal as in London; I think it is mostly Belgian coal. I should think that coal is as likely to produce foul gas, but I really do not know. I only know they do not use lime. In the three provincial cases I mentioned, in which 30 grains of sulphur impurity had been fixed of late years, I should have said the companies volunteered that limit; it was not put upon them. In the Crystal Palace District Company's case, I believe they volunteered 20 grains. I gave evidence at the time, which perhaps conduced to their getting their Act in that form. All the information I now give in reference to the matter has come since 1873. I dare say I should be prepared now to qualify a great deal of evidence I then gave as to purification.

Mr. O'HARA: Do you think it advisable that a company should be left entirely free as to sulphur impurities?

Witness: As to sulphur compounds, yes; as to sulphur impurities, no.

Of course, they ought to be restrained from sending out gas with sulphuretted hydrogen in it, but as to sulphur compounds I think they may be safely left perfectly free.

Mr. O'HARA: What would be the amount of sulphur that might, in that way, get into and pollute the atmosphere?

Witness: I do not know about polluting the atmosphere. The quantity of sulphur in other forms than sulphuretted hydrogen would be about 35 grains. It might go up to 40 or more, but not to 50 grains. If you put it at 40 I think that would be the extent.

Mr. O'HARA: Do you not think you can put it up to 50 without any very great effort?

Witness: I will leave that for somebody else to do.

Re-examined by Mr. MICHAEL: Under exceptional circumstances the quantity might be largely increased. I do not mean to suggest for a moment that it is not possible by the use of lime to bring down the sulphur to even something less than the average which has been mentioned; but in order to do that there must be a far greater nuisance than the presence of the sulphur itself. Practically it does not make any difference whether the purifiers are small or large. If they are small they have to be frequently changed, and if they are large they last longer unchanged, so that there is a larger bulk of this foul stuff taken out at once. The oftener you carry off the nuisance the smaller the amount. There is no known means of preventing the nuisance altogether.

Mr. MICHAEL: Is not that contemplated in the very clause of the section which provides that the Referees are to take into account the difficulty of putting an absolute test to the amount of sulphur without occasioning a nuisance to the neighbourhood in which the works are situated?

Witness: Yes, only this company are not under that provision. I do not think that the presence of 40 or 45 grains of sulphur in 100 feet of gas would be injurious to a person burning gas in his own room, but that can be better spoken to by chemists. As far as I have studied the question as an engineer, there is no case in which that amount of sulphur has caused injury, either to person or property.

The CHAIRMAN: You said that the limit of 20 grains of sulphur compounds allowed by the Act of 1860 had practically to be given up, because it was found to be impossible to obviate it.

Witness: It could not practically be acted upon. There are several companies now in London that are still under that Act—the Phœnix and the Surrey Consumers on the south side of the Thames, and the London on the north side of the Thames—and they are not proceeded against.

The CHAIRMAN: I want you to explain this, because you did not quite finish one of your answers. You were asked, "Might it not be the fact that, in some companies, the average of these sulphur compounds was kept down to 13 grains?" and you said, "Yes; that might be so, but that is not the question." I want to know what it was you meant to say?

Witness: I was asked that question in regard to the works of The Gaslight and Coke Company at Beckton, Bow, and Bromley, where they can use any quantity of lime without creating a nuisance to the surrounding neighbourhood.

Mr. O'HARA: You were asked that question by me, in reference to all the gas companies in London except the South Metropolitan.

Mr. MICHAEL: You read, as I understand, to the witness, the average amount of impurity from sulphur compounds during three months period, which amounted to 13·7 grains. Was not that so?

Witness: I understood so.

Mr. O'HARA: What I had in my mind at the time was this: I excluded the South Metropolitan, and I took all the others. The Gaslight and Coke Company, for example—at all their stations.

Mr. MICHAEL: It is but fair to read this table. The Gaslight and Coke Company's average is 12·6; at Ladbroke Grove, 14·1; Millbank Street, 19—that is cannel gas; Carlyle Square, 14·1; Camden Street, 14·7, &c. My friend has added these together, and takes his figures, I suppose excluding the 19, at 13·7—that is to say, over the whole of that period the proportion of sulphur in other forms than sulphuretted hydrogen, taking the average, amounts to 13·7. Then I asked the witness whether, under exactly the same circumstances, it might not suddenly rise to 25, or even 35, when employing that means of purification?

Witness: It should be explained that fully two-thirds, if not three-fourths, of the gas supplied by that company is made at Beckton, Bow, and Bromley, where they can use an unlimited quantity of lime without creating any nuisance to the neighbourhood; therefore, it is to be expected that we get a very low average of sulphur impurities in the gas supplied from those stations; but from the stations and districts where it is not admissible to use a large quantity of lime it will be found that the sulphur impurities are very much larger, and what I meant by "that is not to the point" was this, that while it was quite possible, by the abundant use of lime, to bring down sulphur impurities to a standard like 13·7, or even less, the means of doing that would create a far greater nuisance than the nuisance they do get rid of by the elimination of a difference of between 13 and say 35 grains of sulphur from the gas.

The CHAIRMAN: Then do I understand that the reason why it is found practically impossible to maintain the limit of 20 grains, required by the statute of 1860, is on account of the nuisance?

Witness: Yes; and the impossibility of getting space in which to manipulate the gas through lime.

The CHAIRMAN: Have you, yourself, heard of any complaint from the Crystal Palace district of the nuisance of the lime works?

Witness: I have not. I do not live in that neighbourhood, but I believe evidence will be given to that effect.

The CHAIRMAN: Then, besides the injury to the hands and eyes of the men who clear out these lime purifiers, do you consider there is any injury done besides to the health or life of human beings?

Witness: I am not aware that they permanently suffer from it, but they have to be paid extra wages, and they have to be coaxed to their work. It certainly does lead men into drinking habits; they will drink, and drink to excess, over this work. To outsiders, who are not employed in it, there is really no nuisance except the smell.

The CHAIRMAN: As to the metropolitan companies, you are aware of the existence of the restriction, between 1860 and 1868, of 20 grains, the same as in the Act of this company, and you know that there was substituted for it, in 1868, the Referees jurisdiction?

Witness: Yes.

The CHAIRMAN: You knew it in 1873, when you gave evidence?

Witness: I did; but I thought that out in the country, as these people were, they might be able to use that quantity of lime without creating a nuisance; but the district has got so overbuilt that it is a very great nuisance. In fact, that point was put to me; I am free to say, that the the question of the 20 grains was not in my proof for the promoters. It was put to me in an off-hand way, and I said, "I think you may safely put it in at 20 grains." I was aware of the practice of the metropolitan companies before that.

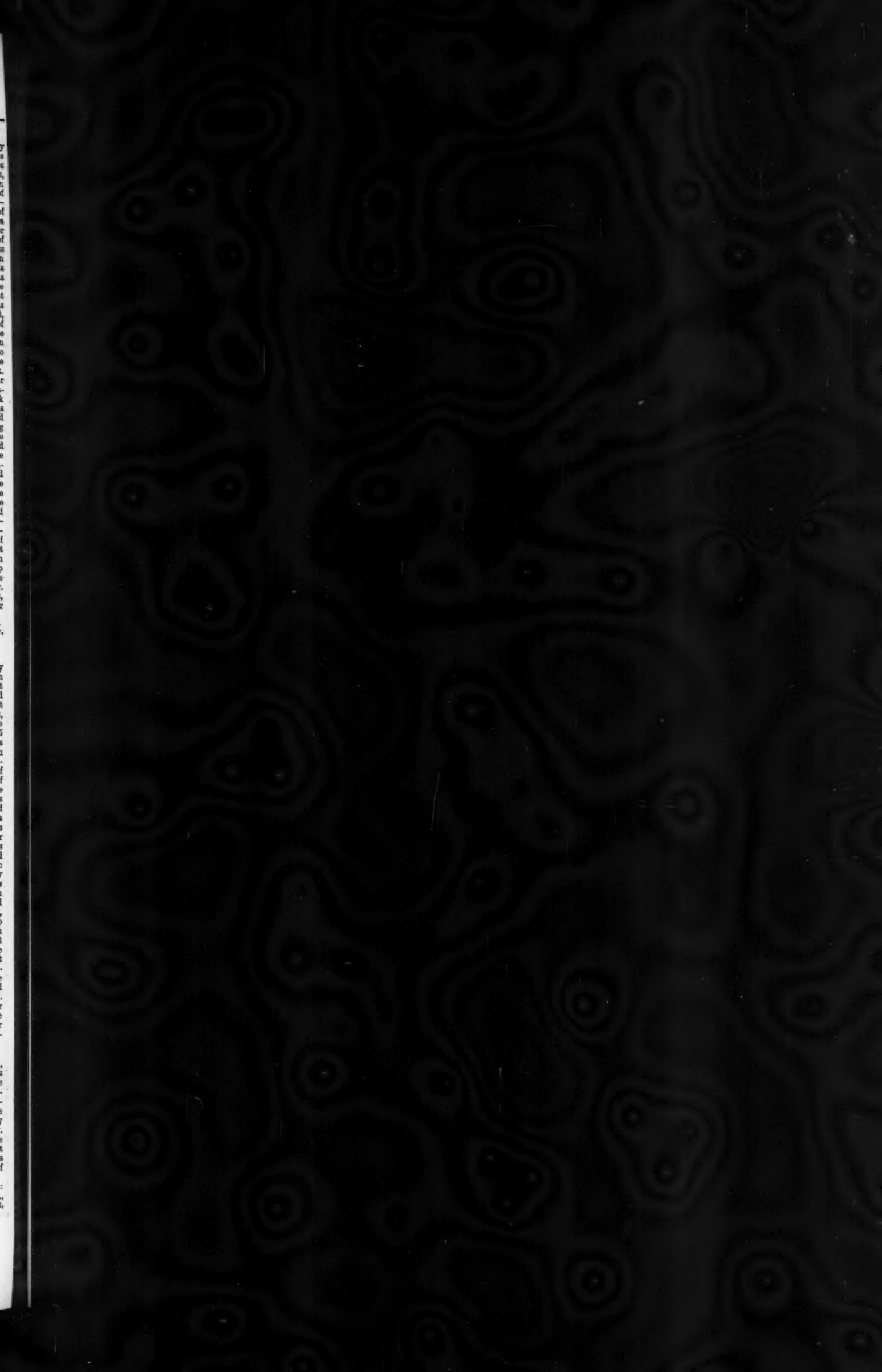
(To be continued.)

DEEP WELL BORINGS IN LONDON.

The constantly increasing wants of our English Metropolis were very amply provided for during all the earlier stages of its history by the stores of water contained in the extensive beds of gravel lying within the Thames Valley. These stores of water could be reached by means of shallow wells, and all the ancient and famous pumps of our city drew their supplies from this source, But, as the population of the district increased, the value of this source of water supply became greatly impaired from two causes—firstly, the excessive drain upon it, caused by the rapid multiplication of wells; and, secondly, the pollution of its waters by the refuse matter of a great city. Hence it became necessary to seek for new sources of water supply, and the success which had already attended the construction of artesian wells in the tertiary districts of Northern France led to attempts being made to obtain supplies in a similar manner by putting down borings through the impervious London clay into the water-bearing beds of the lower London tertiaries. For a time the quantity of water thus obtained, as at Merton, Garrett, and many other points, seems to have induced the belief that an inexhaustible source of the all-essential element had been discovered; but the rapid multiplication of these artesian wells soon revealed the fact that the new and valuable stores had their limit, and that this limit was being very rapidly approached, in consequence of the excessive demands which were now being made upon the new source of supply. The deepening of the wells, by which means water was drawn from the chalk, as well as from the tertiary strata, promised, however, to do something towards staving off the evil day when London would no longer be able to depend on draughts being honoured by her great subterranean bank. Such was the state of the question when Mr. Prestwich, now the Professor of Geology in the University of Oxford, undertook its complete investigation as an important geological problem. No one more competent for the task could possibly have been found, for during many years Mr. Prestwich's studies had been devoted to the Tertiary deposits of the London and Hampshire basins, and his great work, "A Geological Inquiry respecting the Water-Bearing Strata of the country around London, with reference especially to the Water Supply of the Metropolis," which was published in 1851, is a masterpiece of minute observation and close and accurate reasoning. More than this, the geologist points to the work with pardonable pride, as affording convincing proof that his science has now acquired a character for exactness analogous to that which is justly regarded as the crowning attribute of astronomy. After a most elaborate study of the nature and relations of the various strata which crop out all round the London basin and of the disturbances to which they have been subjected since their deposition, Mr. Prestwich ventured on a bold prediction—namely, that the chalk beneath London would be found to have a thickness of 650 feet, the upper greensand of 40 feet, and the gault of 150 feet. (*Op. cit.* p. 142.) At the time when this announcement was made no well in London had been sunk to a greater depth than 300 feet in the chalk, but now we can appeal to no less than four deep borings in the Metropolis, which afford the most convincing proof of the reliability of the data, and the accuracy of the reasoning by which Mr. Prestwich arrived at his interesting results. For the sake of distinctness, we place the estimated and determined results side by side in a tabular form:—

	Mr. Prestwich's Estimate.	Boring at Kentish Town.	Boring at Crossness.	Boring at Loughton.	Meux's Brew.
Chalk	650	645	646	650	653
Upper greensand	40	133½	12	40	28
Gault	150	130½	148	(?)	139

When it is remembered that the chalk graduates downwards insensibly into the upper greensand, and that it is almost impossible to decide on their line of separation in the cores brought up by boring operations, it will be admitted on all hands that the agreement between the estimated and proved results is marvellously close. One of the most important conclusions of Mr. Prestwich's work was that the strata below the gault, the so-called "lower greensand," would in the future afford a most valuable underground source of water supply to our overgrown city. But in 1855 Mr. Godwin-Austen brought before the Geological Society of London his masterly essay "On the Possible Extension of the Coal Measures beneath the South-Eastern Part of England," in which he announced the conclusion—based on a most elaborate study of the geological structure of the South of England and the adjoining portions of the Continent of Europe—that an old ridge of Palæozoic rocks underlies the line of the Thames Valley, and is only concealed from us by the upper cretaceous strata. Mr. Godwin-Austen's announcement was as strikingly verified as was that of Mr. Prestwich; for, in the same year that it was made, a boring at Kentish Town, which passed through the gault, reached a curious series of red rocks, which are now believed by geologists to be either a portion of the old Palæozoic ridge itself, or a set of littoral deposits formed upon its flanks. And in 1857 the deep boring at Harwich afforded still more unmistakeable evidence of the existence of this old Palæozoic ridge in the fact that black slaty rocks were found immediately below the gault clay. Although the old ridge of Palæozoic rocks must thus limit the area of the available water-bearing "lower greensand" beneath the metropolitan district, yet Professor Prestwich has constantly argued that very large and valuable supplies of water will yet, in all probability, be obtained from the latter source. Hence it is that the endeavour to tap this great subterranean reservoir, which is now being carried out in such an enterprising spirit by Messrs. Meux and Co., in the Tottenham Court Road, is attracting so much attention from geologists and engineers. The nodular beds at the base of the gault were reached at a depth of 999 feet from the surface, and some 60 feet of rock below has since been penetrated. The splendid cores brought up by the diamond borer are at once submitted to Mr. Robert Etheridge, the palæontologist of the Geological Survey, who is carefully studying every trace of fossils which they exhibit. At present there are very strong grounds for believing that the "lower greensand" has been reached, and we soon hope to be able to announce that the new source of water supply, so long ago pointed out by Professor Prestwich, has at last been made available for the ever-increasing necessities of this great city.—*Nature.*

STRIKE AT THE NORWICH GAS-WORKS.—At the Norwich Town Council, on Tuesday, the 8th, complaints were made that the repair of the streets after main-laying was not proceeding satisfactorily, and in reference thereto, the town-clerk stated that on the previous day he had had an interview with the gas company's engineer on the subject. The engineer confessed that the streets were not repaired so rapidly as he could have desired, which was owing to the want of men, and he applied to the city authorities to grant them the loan of one or two men to assist in the work. A letter embodying that application had since been sent to the Executive Committee for consideration. It might as well go forth to the public that all the men employed at the gas-works had struck that morning. Measures were, however, being taken, so that the city should not suffer from want of a supply of gas. The company hoped in a few days to settle the matter.

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